

# Engineering News Flashes

## Silver-Plated Bearings for High Speed in Wartime Operation

In making silver-plated bearings, the rate of plating can be more than trebled by the use of potassium cyanide. This material was formerly imported from Europe, but is now made in this country by the electrochemicals department of E. I. duPont de Nemours & Co., Inc., Wilmington, Del. According to this company, literally tons of silver are now being used every week in the fabrication of bearings to withstand high loads and high speeds in wartime operation. Potassium cyanide is also used in copper-plating war materials and as a nitriding agent in surface-hardening steel.

## X-Ray Tubes with Beryllium Windows Speed Tests of Alloys

Windows made of the metal beryllium, which, although opaque to light, is more transparent to certain kinds of X-rays than glass, have aided in speeding tests of materials used in various types of war equipment. The advantage of beryllium is that its X-ray absorption is less than that of any other material that could be used, with the exception of cellophane. The latter material, however, can only be used under certain conditions, and is not suitable for general application. The use of beryllium has increased the speed of making the required tests about fifteen times.

Although beryllium has been used for some time as an alloying element in copper and other metals, this is the first use ever found for it in its pure form. Beryllium is very light in weight—about 30 per cent lighter than aluminum. Of the metals used for structural purposes, only magnesium is lighter than beryllium.

## Timken Scrap-Picker Speeds Up Scrap Collection

A power-operated, self-contained, magnetic scrap-picker has been designed and constructed by the Timken Roller Bearing Co. from odds and ends of materials. This equipment now does the work of six men in gathering up scrap in the company's railroad yards, and does, in two hours' time, what these six men—consisting of three two-men eight-hour crews—formerly did in twenty-four hours.

A Diesel engine is mounted on an ingot buggy,

the engine driving a direct-current generator which supplies power to the magnet and the electric motor drive. The magnet is 39 inches in diameter, and can lift 900 pounds of heavy scrap or 300 pounds of metal turnings at one time. A box is provided in front of the picker which holds about 1200 pounds of scrap. The magnet is mounted on a boom that has a swing of 12 feet.

## Gearmotors Replace More than Two Hundred Gas Engines

In order to release fuel gas for more essential uses, as well as to improve efficiency and effect economies in operation, a large California oil company has replaced 211 gas engines on as many oil wells by gearmotors. The cost of the gearmotors was \$188,000; it is expected that the economies effected will pay for the new equipment in about three years.

## Micarta Bearings Employed for Propeller Shafts

Bearings made from the plastic material Micarta are now being used for propeller shafts in light vessels, replacing bronze and babbitt bearing materials. In some ships, Micarta is also replacing bearings made from the heavy wood lignum vitae which has been widely used, but which often cracks under the pounding of stormy seas. It is believed that Micarta for this type of bearings will permanently replace other bearing materials, because it wears longer, causes less frictional loss, and is unaffected by sea water.

The bearings are made by wedging staves of Micarta into a cylindrical metal shell and boring the plastic to fit the propeller shaft. Grooves are cut lengthwise in the plastic to allow sea water to enter and act as a lubricant. While salt water corrodes metal bearings, it makes Micarta smoother and almost frictionless. Hard rubber bearings resist corrosion too, but they cause considerably more friction than the plastic.

Both lignum vitae and Micarta bearings were installed in a twin-screw merchant ship at the same time and removed three years later. It was found that the wood had worn nine times as much as the plastic. Furthermore, the shaft that was equipped with the Micarta bearings showed no wear, while the shaft provided with wood bearings showed considerable wear.

# EDITORIAL COMMENT

In an editorial in the *New York Times* attention is called to a number of practices that appear incongruous when the Government expresses more and more concern about a shortage of man-power. According to this editorial, painters in various cities impose restrictions on the use of spray guns in order to slow down jobs; every truck entering the New York metropolitan area has to have a local driver, in addition to the driver already employed; there are cases where plumbers are permitted to install prefabricated piping only if the thread is cut off

## Are We Short of Man-Power When We Waste Labor Like This?

thus wasting materials, as well as labor; in Chicago, employers cannot bring in truck cement mixers unless they hire extra men to stand around and watch; and in various cities, the electricians require that if any temporary light or power is to be used on a construction job, there must be a full-time maintenance electrician who shall not be permitted to do any construction work.

As long as the Administration countenances, and even upholds, these time- and labor-wasting practices, it seems futile to talk about shortage of man-power.

Since there are now millions of workers—men and women—in the war production industries who are using metal-cutting tools for the first time in their lives, it becomes increasingly important to provide adequate instruction in the use of these cutting tools to prevent excessive breakage. Inexperienced shop workers, unless properly instructed, have no idea of the cost of cutting tools, nor do they realize the serious shortage of the alloying elements—vanadium, molybdenum, chromium, and tungsten—that are necessary in the production of the steels used for cutting tools.

Drills and taps, especially in the smaller sizes, are easily broken by an inexperienced operator, simply because he does not understand what

severe strains can be brought to bear upon these tools if they are not correctly applied and used. Milling cutters, too, can be broken, or at least have their teeth ruined, by careless use; and

## Careful Instruction Will Reduce Breakage of Tools

tipped carbide tools are especially susceptible to damage and breakage if they are incorrectly applied and carelessly handled, because of their inherent brittleness.

Hundreds of millions of dollars are being spent annually for cutting tools in the war production industries; hence, even a comparatively small percentage reduction in the breakage of tools would save millions of dollars in the war effort. But more important than the saving in dollars and cents is the saving in time, because broken tools always cause loss of time and of production. Frequently, also, a broken tool may mean the spoilage of work on which much time and labor already have been expended.

Those responsible for the training of inexperienced production workers should, therefore, place especial emphasis on proper instruction.

The making of membership in any association, union, or society a prerequisite to earning a living is contrary to the time-honored conceptions of individual liberty on which this nation was

## Losing Freedom at Home While Fighting Compulsion Abroad

to work—making equipment for the defense of his country—unless he acknowledges allegiance and pays dues to a self-constituted group of men who use compulsion as their weapon. This compulsion becomes especially objectionable—and contrary to all conceptions of democratic government—when the Government itself supports and furthers compulsory membership in an association, union, or society. We are fighting a war for freedom and against compulsory forms of government abroad; we must also preserve individual freedom at home.

# Tool Engineers' Milwaukee Meeting

As usual, the national meeting of the American Society of Tool Engineers, held in Milwaukee, Wis., March 25 to 27, was exceptionally well attended by tool engineers from near and far. In conjunction with the meeting, an exhibition was held in Mechanics Hall, at which over one hundred manufacturers of machine shop equipment of all kinds were represented. Many items of newly developed equipment of interest to the tool engineer and manufacturing executive were on exhibition, and the interest in some of the more spectacular new developments was very marked.

The program of the technical sessions included a number of outstanding papers. There were six technical sessions, each having a specific keynote. Thus, the various sessions were devoted, respectively, to machinability of metals; increasing tool life; tool salvage; women in war plants; new production methods; and new developments in tool engineering.

At the session on machinability of metals, Professor O. W. Boston, of the University of Michigan, presented a paper entitled "Machinability of National Emergency Steels." Another subject discussed at the same meeting dealt with "Machinability Ratings of Metals and Cutting Fluid Recommendations."

The subject of increasing tool life was dealt with in three papers, the authors being Axel Lundbye, chief engineer of the Crowell-Collier Publishing Co., Springfield, Ohio; R. M. Goodsell, secretary-treasurer, Racine Plating Co., Inc., Racine, Wis.; and G. Walter Esau, of E. F. Houghton & Co., Philadelphia, Pa.

At the tool salvage session also, three papers were presented. A. M. Setapen, industrial engineering division of Handy & Harman, New York City, spoke on "Silver Brazing as Applied to Tool Manufacture and Salvage." H. W. Foege, midwestern manager and field engineer of the Eutectic Welding Alloys Co., New York City, discussed "Tool Salvage by Low-Temperature Brazing." L. C. Gorham, of the Gorham Tool Co., Detroit, Mich., spoke on "Cast High-Speed Welding Rods."

The session on women in war plants brought forth some interesting facts. Papers were read by Dr. B. I. Beverly, director of health and personnel, Republic Drill & Tool Co., Chicago, Ill.; William A. Simonds, Ford Willow Run Bomber plant, Ypsilanti, Mich.; and J. I. Onarheim, supervisor of employment, Allis-Chalmers Mfg. Co., Milwaukee, Wis.

The session devoted to new production methods dealt with some of the latest and most unusual methods. Malcolm J. Judkins, chief engineer, Firthite Division, Firth-Sterling Steel Co.,

McKeesport, Pa., spoke on "Hyper-Milling and Rake Angles on Sintered Carbide Tools." This paper placed emphasis on new conceptions of what actually takes place in milling. The tools and methods used for high-speed machining were dealt with by Arthur A. Schwartz, chief tool engineer of the Bell Aircraft Corporation, Buffalo, N. Y. A most unusual contribution to the meeting was made by R. J. Goldie, vice-president of the Timken-Detroit Axle Co., Detroit, Mich., who spoke on the newly developed art of producing gears without machining.

The final technical session had for its keynote the slogan "Tool Engineering Horizons." At this session, two most interesting papers were read, one on the "Latest Developments in Glass Gages," by T. J. Thompson, manager of the Industrial Division, Corning Glass Works, Corning, N. Y.; and another on "Future Possibilities of Induction Heating," by Frank W. Curtis, chief engineer of the Van Norman Machine Tool Co., Springfield, Mass.

At the annual dinner held in conjunction with the meeting, Brigadier General H. F. Safford, Chief of the Production Service Branch, Office of the Chief of Ordnance, Washington, D. C., spoke on "The Application of Tool Engineering to War Production."

A special feature of the meeting consisted of a showing of recent industrial films bearing on the tool engineer's problems. These were shown in a special projection room in the Milwaukee Auditorium.

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## Notes on Scrap Salvage

During 1942, General Electric plants salvaged approximately 194,000 tons of scrap. Four-fifths of this was shipped to steel mills, foundries, smelters, and other large users of iron, steel, and non-ferrous metal scrap; the remainder was used in the company's own operations. During the year, a "treasure hunt" for obsolete tools, fixtures, and other dormant scrap accounted for over 12,500 tons of materials of all kinds. Silver to the amount of 85,300 ounces was also recovered.

Approximately 14,000 tons of idle industrial equipment and metal scrap—largely iron and steel—will be recovered by the dismantling of the Vulcanite Portland Cement Co.'s plant near Phillipsburg, N. J. This plant has not been used since 1932. Usable equipment will be sold to plants that can put it to immediate use for war production. Any equipment that is not sold for such purpose will be scrapped and the scrap shipped to steel mills for immediate use.

# Buick Plant Standardizes Diamond Tools

**D**IAMOND tool costs have been steadily mounting in many metal-working plants during recent years because of the great increase in precision grinding, turning, boring, and facing. This is especially true in plants devoted to the mass production of highly accurate mechanisms, such as aircraft engines, where practically every part calls for utmost precision. At the Melrose Park plant of the Buick Motor Division of the General Motors Corporation, diamond tool costs have been cut 30 per cent, and even greater reductions are anticipated as a result of standardization methods. The annual savings at this plant may amount to \$150,000.

A proportion of this saving has resulted from closer control of discarded tools, but most of the economies have been effected by the use of the Kodi standardized diamond tools, a new line recently developed by the Koebel Diamond Tool Co., Detroit, Mich., in cooperation with Buick engineers. The need for a standardized system became apparent when investigations disclosed wide inconsistencies in the design of the diamond-holders in use. Some grinding machines were equipped with a worm mechanism for adjusting the wheel-dressing diamond; on others, the diamond-holder had an externally threaded shank; and on still others, the shank had a tapped hole. Some diamonds had slotted shanks, others had striated shanks, and so on. Some were cylindrical, others were round with a flat milled on one side, and still others were tapered.



Fig. 1. One of the Standard Kodi Diamond Nibs about to be Inserted into a Simple Adapter for Use on a Grinding Machine

Some shanks had a diameter of  $7/16$  inch, others a diameter of  $5/8$  inch, and still others a diameter of only  $1/4$  inch.

Each of the dressing attachments may be the best that could have been designed for the specific purpose. They have given excellent performance, and from the standpoint of the machine tool builder, are completely satisfactory. However, in a large plant this multiplication of designs may constitute a major problem. In one factory, for example, it was found that if machine tool builders' recommendations were followed,

over one hundred styles of diamond tools would have to be stocked to insure continuous operation of all diamond-using machines.

With the Kodi method of standardization, adapters are made up to be permanently assembled in the various machine tools. These adapters are drilled, reamed, and ground in one end to provide a socket for short-shank diamond nibs. In the Buick plant, eighteen

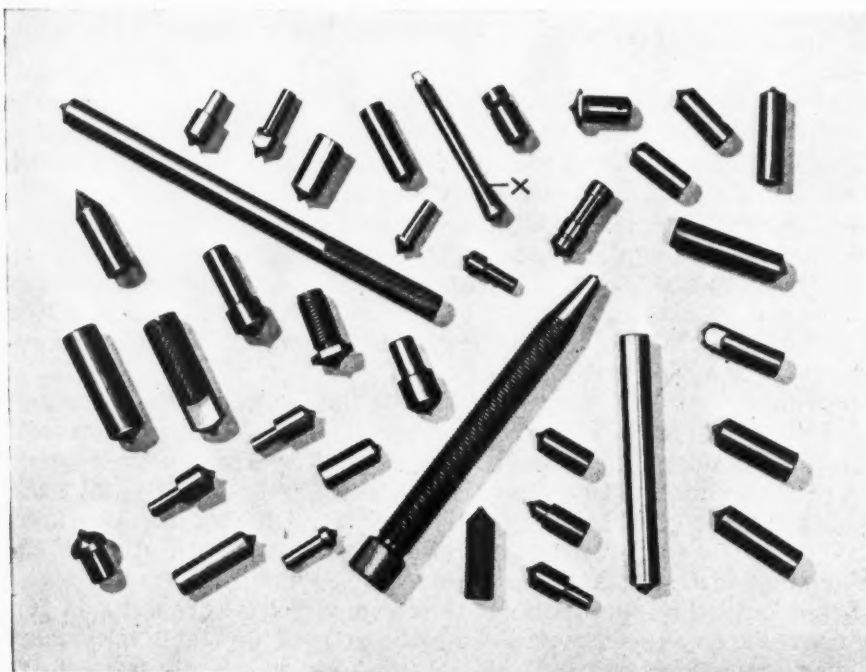


Fig. 2. A Large Variety of Diamond Nibs in Common Use, which could be Replaced by One Standard Nib and a Limited Number of Standard Adapters

different types of diamond tools were formerly in daily use. These have been replaced by quantities of one type of nib, as seen in Figs. 1 and 3, after adapters were supplied to the machine tools. Eight standard adapters have been developed for use under the Kodi system. In Fig. 3 is seen an adapter designed for use on the Pratt & Whitney 10-inch single-wheel hydraulic gear grinder. The holder that is regularly furnished with this machine is of the tapered and threaded design seen at X in Fig. 2, which requires a large amount of machining in manufacture.

The average weight of the eighteen tools formerly used was 28.1 grams each, whereas the single diamond nib weighs only 8.1 grams. Thus the saving in steel per diamond tool has been approximately 72 per cent. Multiply this saving by the millions of diamond tools in use throughout the country, and the potential steel saving becomes important. There are many plants that use several thousand diamond tools per year.

As regards the manufacture of diamond tools, the most important advantage accruing from the standardization of these tools is the saving in machine tool operating time. Five types of machine tools and forty-two different small tools, including milling cutters, reamers, tool bits, die-heads, chasers, taps, and other critical items were required to make the eighteen different nibs previously in use. In contrast, only a lathe and simple turning and facing cuts are necessary for machining the Kodi standard nibs.

A further advantage is derived from the use of standard nibs. Usually diamonds are reset in the same tool-holder after sharpening, which means that as the diamonds wear and are re-sharpened, they are returned to the same operation. Eventually, the operator finds that he is using a 1/4-carat diamond on a job for which a diamond of 1 1/2 carats has been specified. On the other hand, Kodi nibs are grouped into weight classifications when they are reset, and being interchangeable, they can always be used on jobs for which their size is best suited. Furthermore, because of the interchangeability, experimentation with less expensive sizes is facilitated. Inventory control of diamond tools has been eliminated as a problem in the Buick plant by the adoption of this system. Graduations on the nibs are of considerable help to the operator in turn-

ing the diamond in its adapter to insure a sharp cutting point at all times.

Although the savings that may be effected through the standardization of diamond tools may seem small in many plants, if this idea can be adopted throughout the nation, another "tremendous trifle" will be working to bring us one step nearer to victory.

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## Nitriding of Tools

According to E. F. Houghton & Co., Philadelphia, Pa., a nitrided case on taps, rifling cutters, reamers, and other small tools has been found to double and triple the tool life in quantity production. After being hardened and ground, the tools are given a nitrided case to a depth of from 0.001 to 0.002 inch by immersion in a bath known as "Liquid Heat 720," manufactured by E. F. Houghton & Co. The temperature of the bath is customarily from 1050 to 1150 degrees F., and the length of immersion varies from ten to sixty minutes. The nitrided case is particularly valuable for tools used in the machining of shells and gun parts or for other jobs where there is high production requiring the fewest possible number of tool changes.

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The General Electric Co., Schenectady, N. Y., has announced that the orders received for 1942 amounted to \$2,003,000,000, an increase of 77 per cent over the previous record established in 1941. The shipments in 1942 amounted to \$1,047,000,000, or 54 per cent more than in 1941, the previous record year.

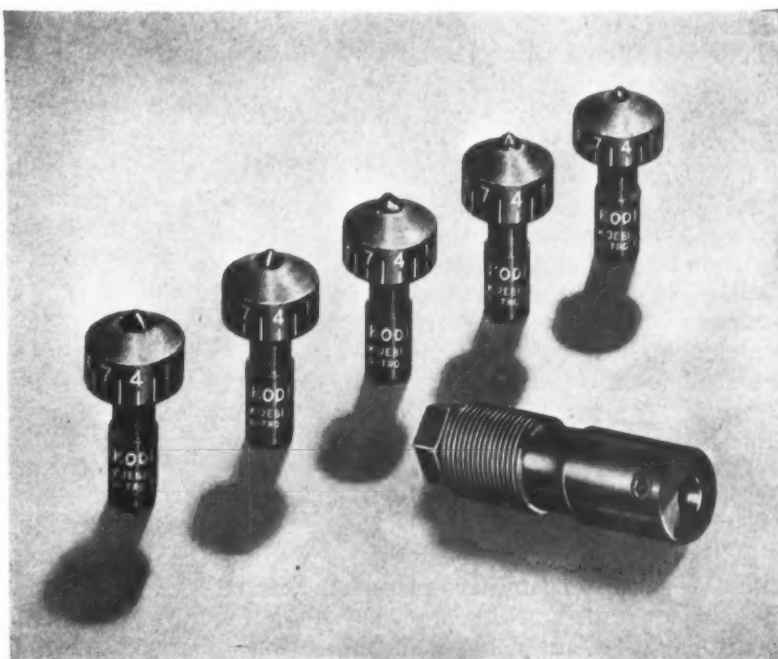


Fig. 3. Five Standard Kodi Diamond Nibs and a Nib Adapter Designed for Use on a Single-wheel Hydraulic Gear Grinding Machine

# How to Secure Fine Surfaces by Grinding

By H. J. WILLS, Engineer  
The Carborundum Co., Niagara Falls, N. Y.

First of a Series of Articles Describing the Factors Governing Fine Surface Quality and the Means by which This Quality Can be Obtained

**A**SIDE from the obvious purpose of reducing friction between bearing surfaces, fine surfaces are required in mechanisms for various other reasons. Thus, rough bearing surfaces wear so excessively in the early stages of operation that considerable changes in dimension occur. At best, adjustments must be made. If the machine is one that will be subject to hard usage or that cannot be permitted to fail in use—as is true of airplane motors and many other items of armament—a considerable run-in time will be required to permit the too rough bearings to wear down to solid metal; the machine must then be disassembled, adjusted, and reassembled. The running-in does slowly and expensively what could be done rapidly and inexpensively by fine grinding—followed in some cases, perhaps, by lapping, polishing, or honing.

With fine grinding it is now commonplace for the bearing surfaces of a machine to be made so smooth that no run-in period is needed. This is of great importance in much armament work, where rapid production of completely reliable equipment is essential.

Fine surfaces of great smoothness are also necessary for air- or fluid-tight seals, as in shock absorbers for airplane landing mechanisms and in gun recoil assemblies.

Some non-bearing surfaces are required to be even smoother than those needed for bearings. On parts such as airplane connecting-rods that are to be subjected to heavy recurring stresses, a scratch even as minute as those left by grinding wheels is not permissible because it is likely to be the nucleus of surface checks and cracks, which would cause the part to fail in service. Therefore, such parts, after the most careful grinding, are frequently subjected to a long and painstaking polishing to remove all abrasive marks.

## *What Indicates Good Surface Quality?*

Although much has been learned about the characteristics of surfaces in recent years, there is still too much reliance placed upon the appearance of a surface as an indication of its

quality—thus, such terms as “mirror” and “reflecting” are frequently used to describe surfaces of fine quality.

Actually, a high luster does not necessarily indicate a good surface quality. A dull, matte surface may be superlatively good, while a surface that will reflect fine print so that it can be easily read may actually be very poor. Luster can be, and too often is, secured by burnishing a surface with a dull grinding wheel. This bends down the high ridges of metal and partially fills the valleys, producing a superficial surface that may have high reflecting power—until it is put into use. Then the material that has been bent down flakes off and the underlying rough surface appears. This is an instance of a poor surface being given a fine finish—which indicates that there may be considerable difference between “surface quality” and “finish,” although the terms are often used interchangeably.

Another way to get a “mirror” finish on a relatively poor surface is to use silicon-carbide abrasive wheels. The sharp crystals leave deep, narrow grit marks, which reflect light in such a way as to make the surface appear lustrous. On the other hand, aluminum-oxide wheels leave shallow, wide marks that give a comparatively dull appearance to a much better surface.

## *How is Surface Quality Determined?*

It is no longer necessary to judge a surface by its appearance and feel, nor need a surface be described by such elastic and inaccurate terms as “commercial,” “good commercial,” “mirror,” or “ultra,” which mean different things to different men. A committee of the American Standards Association sponsored by the American Society of Mechanical Engineers and the Society of Automotive Engineers has recommended the “root mean square” (r.m.s.) method of evaluating surface roughness; this provides industry with a method of measuring by means of instruments that has a definite meaning and that can be specified on a drawing or transmitted by telephone.

Instruments are available that give direct readings in r.m.s. values in micro-inches. Others

draw a profile curve, showing the hills and valleys of a surface. Such a curve can be used directly to evaluate a surface or it can be used for calculating the root-mean-square values of the surface.

Both methods have their advocates. Those who favor the r.m.s. measurement maintain that it is the average distance from peak to valley that is important. The others contend that the actual deviations should be known. The fact that the r.m.s. values commonly run from one-fourth to one-third the maximum distance from the valley bottom to the top of the peak (thus making the roughness seem less than it is) is objectionable to some. Then, too, in some cases, two surfaces of entirely different characteristics may have the same r.m.s. value. One may consist of small peaks and shallow valleys close together. When the peaks are worn down during the run-in period, an appreciable dimensional change may result. Another might be made up of broad plateaus separated by infrequent but deep valleys. Since the plateaus provide a good bearing surface with low unit pressures, the wear is slight during the run-in period.

While precise measuring instruments are being used more and more as inspection tools in shops, the most common method—and the one used by several large shops doing precision work—is to judge the finish by eye and by drawing the fingernail across the surface. Taken in connection with standard reference pieces which give, for each type of machining, the appearance and feel of a surface of given r.m.s. roughness in micro-inches, it is claimed that this method not only permits of inspection within close limits, but also enables the designer to choose the type of surface he wishes from the specimens, and to specify it in r.m.s.

### **Definitions of Surface Irregularities**

Although surface quality depends also upon such elements as molecular or atomic structure, hardness, crystal form, and the like, for the purpose of these articles only a few factors will be considered which, to a greater or less degree, are within the control of the grinding machine operator. The Committee on Standardization of Classification and Designation of Surface Qualities defines these factors as follows:

**Surface Flaws**—Irregularities of any sort that occur at only one place or at relatively infrequent and widely varying random intervals in a surface. A surface flaw may be a scratch, a ridge, a hole, a peak, a check, a crack, etc.

**Waviness**—A kind of surface deviation that consists of recurrent or random irregularities in a surface having the form of waves. On smooth machined surfaces, the length of such waves ordinarily is between 0.04 and 1.0 inch, and the height of the waves is generally not

more than a few thousandths inch. Such irregularities can be measured by conventional dial gages of appropriate sensitivity, with spherical work contacts of about 0.125 inch diameter.

**Roughness**—Recurrent or random irregularities in a surface that have the form of small waves or bumps. Roughness may be considered as being superimposed upon a nominal surface or upon a wavy surface. On smooth machined surfaces, the distance between the high spots of such irregularities is ordinarily between 0.0002 inch and 0.010 inch, and their height is very much less than their width, usually being between 0.000001 and 0.0005 inch. Similar dimensions for the irregularities in surfaces that are coarser or rougher than those generally classified as smooth will be proportionately larger.

A *nominal surface* is one that is perfectly smooth and conforms in all respects to the ideal shape of that surface, as a plane or a cylinder.

### **How Can the Required Surface Qualities for Specific Purposes be Determined?**

Now that we have seen what surface qualities are and how to measure them, there arises an extremely important question on which there are great differences of opinion—namely, "How good should a surface be?" One practical answer would be, "Good enough, but no better than is needed."

Here, again, we find differences of opinion. So far, there has been no general agreement as to how good a surface is needed for such parts as the bearing surfaces on automobile engines, to say nothing of bearing surfaces on airplane engines and all the varied mechanisms that are part of armament items. When in doubt, and when so much is at stake, it is usual for the designer to specify surfaces of a much greater degree of perfection than is needed. That is safe from the point of view of performance, but it may be very wasteful of time and effort.

Here is a case in which the misinterpretation of loose phraseology resulted in considerably more expensive and lengthy finishing operations than were necessary. The buyer of an airplane motor part had specified "ultra" finish. To the seller, that meant a surface of around one to two micro-inches r.m.s. He could not get that finish with the equipment he had; so he consulted an abrasive engineer, and by means of an investment in new and special machines and a special abrasive, a surface of one micro-inch r.m.s. was secured.

But production was so slow that the buyer began complaining about deliveries. This led to the discovery that the buyer had meant by "ultra" finish a roughness not to exceed 13 micro-inches—which could readily be attained by grinding alone—without the expensive, slow, subsequent operations.

## Too Good a Finish is Often Provided at Excessive Cost

It is possible to get too good a surface for a given purpose. Anyone who has had experience with precision gage-blocks knows how difficult it is to slide one gage-block along another. Too good a surface on parts that have sliding contact, as for example, table ways, may produce the same effect.

Lacking adequate surface measuring equipment, it is not unusual for a shop that is striving for very fine surfaces to add operations such as rough- and finish-lapping. In one case, for example, six operations were used in an attempt to reduce the roughness of a ground surface from around 35 micro-inches r.m.s. to about 2 micro-inches. When the surface left by each operation was subjected to measurement by a profilometer, it was found that the desired smoothness was secured by the second operation, and that the four subsequent operations failed to improve the surface further. This is not at all uncommon. In ordinary times, such added costs might be a serious handicap in the competitive market. In wartime, the waste of time amounts to unconscious sabotage.

One company has drawn up a table showing the costs of securing surfaces of various roughness. It is probably also a fair indication of the time required. Taking the cost of securing a hardened, ground, lapped or polished surface as 100, the cost of lapping or honing a turned or ground part to eliminate tool marks is 90; fine grinding is 50; finish grinding is 40; medium grinding is 20; and rough grinding is 5 to 10. The difficulty with this tabulation is to determine just what kind of a surface is secured by the last four operations listed.

### Commercial Finish on Specific Parts

Here are some roughness figures supplied by several automobile manufacturers:

PART	ROUGHNESS (r.m.s. micro-inches)
Valve stems .....	3; 1-5; 13-15; 21-30
Cylinder bores .....	3-7; 6-10; 10-12
Piston-pins .....	3-7; 6-10; 10-12
Tappet faces .....	2
Tappet barrels .....	3
Crankpins .....	3-4; 3-8
Plug gages .....	0.4-0.7; 0.3-2.5
Roller-bearing faces .....	1-2; 2-10
Camshafts .....	4-6; 6-10; 14-16
Armature shafts .....	2-3; 2-6
Pistons .....	2-4; 3-8; 11-15; 28
Connecting-rods .....	1-5; 11-14
Connecting-rod bushings .....	16-20; 35

The following list gives similar typical information obtained from three manufacturers of airplane engines:

PART	ROUGHNESS (r.m.s. micro-inches)
Piston-pins, outside diameter .....	4; 4; 2-3
Knuckle pins .....	6; 6
Valve stems .....	6; 6
Valve tips .....	16
Valve-tappet roller .....	6; 6
Crankpins .....	4
Seats for ball bearings, general .....	10
Articulating-rod bushings .....	13
Articulating-rod pin .....	2-3
Cylinder barrels .....	3-6; 9
Valve guides .....	13
Piston-pin holes in pistons .....	10
Cam lobes .....	13
Tappets .....	6
Counterweight bushings .....	4
Crankcase bearing rings .....	20

In subsequent articles of this series, the care and operation of machines in fine grinding, the selection and manipulation of grinding wheels, the selection and correct use of coolants, and further finishing operations when grinding alone will not give the quality of surface required will be discussed.

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### Latest Army-Navy "E" Awards

The latest names to be added to the list of companies in the machine-building and allied fields, who have received the Army-Navy "E" award for outstanding production of war equipment are given in the following:

Clark Trutractor Division, Clark Equipment Co., Battle Creek, Mich.  
Fairfield Mfg. Co., Lafayette, Ind.  
D. O. James Mfg. Co., Chicago, Ill.  
Lindberg Engineering Co., Chicago, Ill.  
Lucas Machine Tool Co., Cleveland, Ohio.  
National Tool Co., Cleveland, Ohio.  
Pangborn Corporation, Hagerstown, Md.  
Stow Mfg. Co., Binghamton, N. Y.  
Western Gear Works, Seattle, Wash.  
Whitman & Barnes, Detroit, Mich.

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### First Steps Toward Solving Corrosion Problems

In order to aid industry in solving specific corrosion problems, the International Nickel Co., Inc., has designed what is known as a "Corrosion Data Work Sheet." This work sheet is, in effect, a check list to insure proper consideration and evaluation of all factors influencing corrosive action. Plant engineers are invited to submit the completed work sheet to the company for suggestions and advice. The work sheets can be obtained without charge from Technical Service, International Nickel Co., 67 Wall St., New York City.

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## LENGTH OF CHORD FOR LAYING OUT EQUAL SPACINGS AROUND A CIRCLE—1

The tables in this and the next three Data Sheets give the lengths of chords for laying out the circumference of a circle into any number of equal parts ranging from 3 to 113. They are based on the formula:  $L = D \times \sin \frac{360^\circ}{2N}$

where  $L$  = length of chord;  $D$  = diameter of circle; and  $N$  = number of parts into which circle is to be divided.

The first column lists spacings  $N$  from 3 to 113. The second column gives the corresponding values of  $\sin \frac{360^\circ}{2N}$ , or the

lengths of chord when the diameter  $D$  of the circle is 1. The next eight columns give the respective lengths of chord for circle diameters of 2, 3, 4, 5, 6, 7, 8 and 9. Thus, the length of chord for laying out fourteen equal spacings around a circle of 7 inches diameter is 1.55764 inches.

For circles of any diameter where the length of chord cannot be read directly from a single column of the table, the procedure is as follows:

**Example 1**—Find the length of chord for laying out eleven equal spacings around a circle of 9.4 inches diameter. In the second column, opposite 11 in the first column,

$$\sin \frac{360^\circ}{2N} = \sin \frac{360^\circ}{2 \times 11} = 0.28173$$

Then  $L = 9.4 \times 0.28173$

$$9.0 \times 0.28173 = 2.53557 \text{ (Take value in Col. 9)}$$

$$0.4 \times 0.28173 = 0.11269 \text{ (Take value in Col. 4 and move decimal point one place to left)}$$

$$9.4 \times 0.28173 = 2.64826 \text{ inches} = L$$

**Example 2**—Find the length of chord for laying out seventeen equal spacings around a circle of 17.375 inches in diameter. In the second column, opposite 17 in the first column,

$$\sin \frac{360^\circ}{2N} = \sin \frac{360^\circ}{2 \times 17} = 0.18375$$

$$\text{Then } L = 17.375 \times 0.18375$$

$$10.000 \times 0.18375 = 1.8375 \text{ (Take value in Col. 1 and move decimal point one place to right)}$$

$$7.000 \times 0.18375 = 1.28625 \text{ (Take value in Col. 7)}$$

$$0.300 \times 0.18375 = 0.055125 \text{ (Take value in Col. 3 and move decimal point one place to left)}$$

$$0.070 \times 0.18375 = 0.0128625 \text{ (Take value in Col. 7 and move decimal point two places to left)}$$

$$0.005 \times 0.18375 = 0.00091875 \text{ (Take value in Col. 5 and move decimal point three places to left)}$$

$$17.375 \times 0.18375 = 3.1926 \text{ inches} = L$$

Diameter of Circle  $D$

No. of Equal Spacings or Area $N$	1	2	3	4	5	6	7	8	9
$\sin \frac{360^\circ}{2N}$	0.86603	0.70711	0.58779	0.50000	0.43301	0.38568	0.34202	0.30902	0.28173
Length of Chord $L$	1.73206	1.41421	1.17558	1.00000	0.86603	0.76604	0.68807	0.62606	0.57735
2	0.86603	1.73206	2.59809	3.46410	4.33015	5.19618	6.06221	6.92824	7.79427
3	0.57735	1.15470	1.73206	2.59809	3.46410	4.33015	5.19618	6.06221	6.92824
4	0.50000	1.00000	1.50000	2.00000	2.50000	3.00000	3.50000	4.00000	4.50000
5	0.43301	0.86603	1.29904	1.96126	2.59809	3.19260	3.75924	4.29422	4.79881
6	0.38568	0.76604	1.15470	1.73206	2.31839	2.89926	3.48481	4.07422	4.66759
7	0.34202	0.68807	1.03993	1.50000	2.00000	2.50000	3.00000	3.50000	4.00000
8	0.30902	0.61804	0.92706	1.23608	1.65410	2.07212	2.48922	2.90634	3.32346
9	0.28173	0.57735	0.86603	1.15470	1.44203	1.73206	2.01924	2.30646	2.59368

MACHINERY'S Data Sheet No. 487, April, 1943

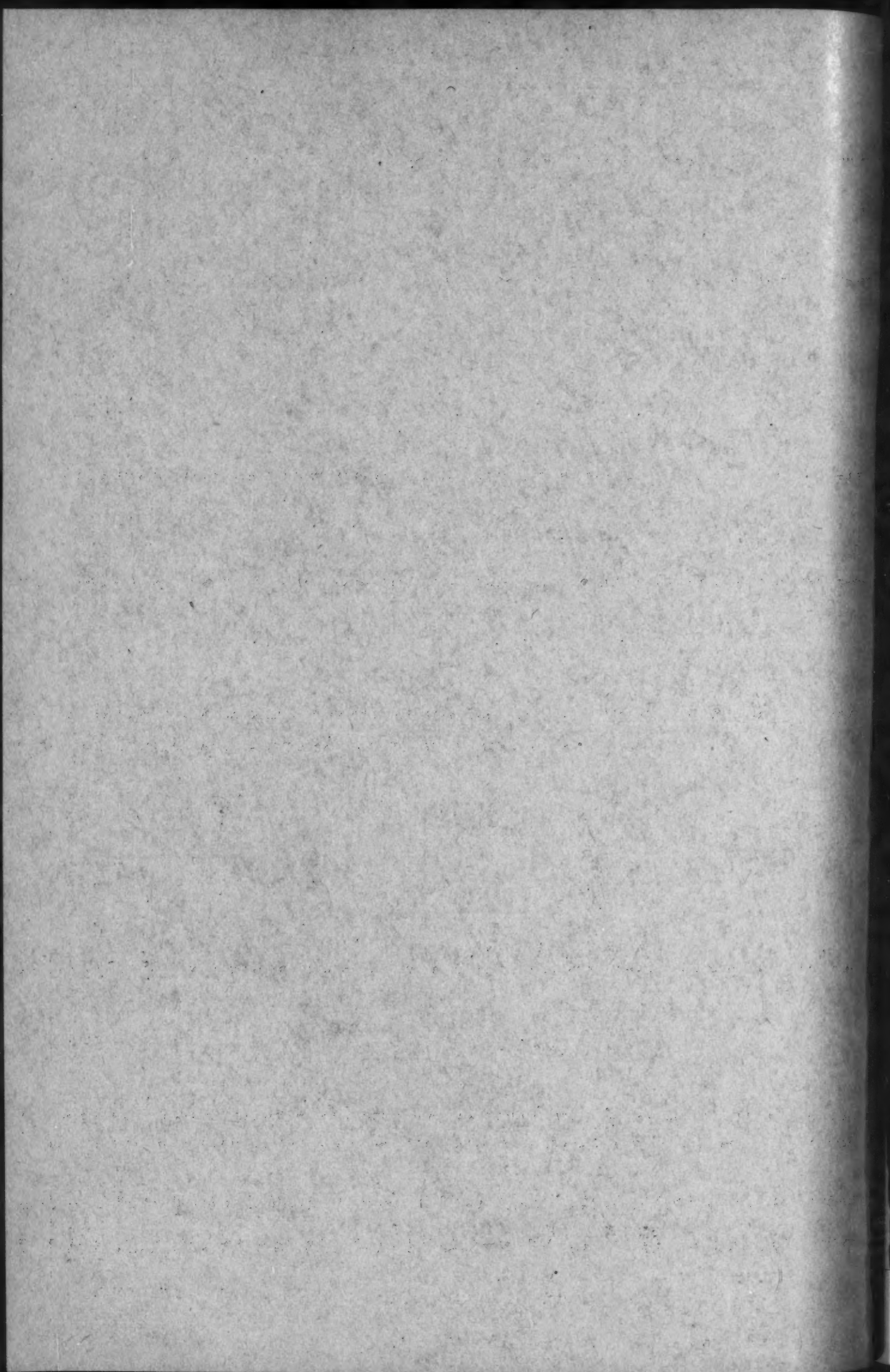
Compiled by J. I. Hommel  
Westinghouse Electric & Mfg. Co.

## LENGTH OF CHORD FOR LAYING OUT EQUAL SPACINGS AROUND A CIRCLE—2

No. of Equal Spacings or Area $N$	1	2	3	4	5	6	7	8	9
$\sin \frac{360^\circ}{2N}$	0.86603	0.70711	0.58779	0.50000	0.43301	0.38568	0.34202	0.30902	0.28173
Length of Chord $L$	1.73206	1.41421	1.17558	1.00000	0.86603	0.76604	0.68807	0.62606	0.57735
11	0.28173	0.57735	0.86603	1.15470	1.44203	1.73206	2.01924	2.30646	2.59368
12	0.25981	0.51961	0.78184	1.03993	1.29904	1.55564	1.81135	2.06706	2.32277
13	0.23933	0.47864	0.71796	0.96728	1.19660	1.43592	1.67524	1.91456	2.15388
14	0.22523	0.44504	0.66756	0.90008	1.11260	1.33512	1.55764	1.78016	2.00268
15	0.20791	0.41682	0.62373	0.83164	1.03955	1.24746	1.45537	1.66328	1.87119
16	0.19509	0.39018	0.58527	0.78036	0.97545	1.17054	1.36563	1.56072	1.75581
17	0.18375	0.36750	0.55125	0.73500	0.91875	1.10250	1.28625	1.47000	1.65375
18	0.17365	0.34730	0.52095	0.69460	0.86825	1.04190	1.21555	1.38920	1.56285
19	0.16459	0.32918	0.49377	0.65836	0.82295	0.98754	1.15113	1.31472	1.47831
20	0.15643	0.31286	0.46929	0.62672	0.78215	0.93585	1.09051	1.24514	1.40787
21	0.14904	0.29808	0.44712	0.59616	0.74520	0.89424	1.04328	1.19232	1.34136
22	0.14231	0.28462	0.42693	0.56924	0.71155	0.85386	0.99617	1.13848	1.28079
23	0.13617	0.27234	0.40851	0.54468	0.68035	0.81703	0.95319	1.08936	1.22553
24	0.13053	0.26106	0.39159	0.52212	0.65265	0.78318	0.91371	1.04424	1.17477
25	0.12533	0.25068	0.37599	0.50132	0.62665	0.75198	0.87721	1.00264	1.12797
26	0.12054	0.24108	0.36162	0.48216	0.60270	0.72324	0.84378	0.96432	1.08486
27	0.11609	0.23218	0.34827	0.46436	0.58045	0.69654	0.81263	0.92872	1.04481
28	0.11196	0.22392	0.33588	0.44784	0.55980	0.67176	0.78372	0.89568	1.00764
29	0.10813	0.21624	0.32436	0.43248	0.54060	0.64878	0.75684	0.86496	0.97308
30	0.10453	0.20906	0.31359	0.41812	0.52265	0.62718	0.73171	0.83624	0.94077
31	0.10117	0.20234	0.30351	0.40468	0.50585	0.60702	0.70819	0.80936	0.91053
32	0.098017	0.196034	0.294051	0.392068	0.490085	0.588102	0.686119	0.784136	0.882153
33	0.095056	0.190112	0.285168	0.380224	0.475280	0.570336	0.665392	0.760448	0.855504
34	0.092268	0.184536	0.276804	0.369072	0.461340	0.553608	0.645876	0.738144	0.830412
35	0.089639	0.179278	0.268917	0.358556	0.448195	0.537834	0.627473	0.717112	0.806751
36	0.087156	0.174312	0.261468	0.348624	0.435780	0.522936	0.610092	0.697248	0.784404
37	0.084806	0.169612	0.254418	0.339284	0.424030	0.508886	0.593642	0.678448	0.763254
38	0.082579	0.165158	0.247737	0.330316	0.412895	0.495474	0.578053	0.660632	0.743211
39	0.080467	0.160934	0.241401	0.321868	0.402535	0.482802	0.563269	0.643736	0.724203
40	0.078459	0.156918	0.235377	0.313636	0.392395	0.470754	0.549213	0.627672	0.706131
41	0.076549	0.153098	0.229647	0.306196	0.382745	0.459294	0.535843	0.612392	0.688941
42	0.074730	0.149460	0.224190	0.298920	0.373850	0.448880	0.523110	0.597840	0.672570
43	0.072995	0.145990	0.218985	0.291980	0.364875	0.437970	0.510965	0.583960	0.656955
44	0.071339	0.142678	0.214017	0.285356	0.356695	0.423034	0.493878	0.564722	0.635565
45	0.069757	0.139514	0.209271	0.279028	0.348785	0.413542	0.483299	0.553056	0.622813
46	0.068242	0.136484	0.204726	0.272968	0.341210	0.404952	0.473694	0.542436	0.611478
47	0.066793	0.133586	0.200379	0.266772	0.333965	0.400758	0.467551	0.534344	0.600137
48	0.065403	0.130806	0.196209	0.261612	0.327015	0.392241	0.457821	0.523224	0.588657
49	0.064070	0.128140	0.192210	0.256620	0.320350	0.384420	0.448490	0.512560	0.576650

MACHINERY'S Data Sheet No. 488, April, 1943

Compiled by J. I. Hommel  
Westinghouse Electric & Mfg. Co.







# Direct-Current Adjustable-Speed Drives for Machine Tools

Development of the Adjustable-Voltage, Direct-Current Drive has Resulted in Many Variations with Improved Characteristics, Suitable for a Wide Range of Machine Tool Applications. Five Forms of This Type of Drive will be Described in a Series of Three Articles of which This is the First

By G. A. CALDWELL, Industry Engineering Department  
Westinghouse Electric & Mfg. Co.

**S**PEED variation of machine tool drives requiring a range of 10 to 1 or more can often be effected satisfactorily by mechanical means. In many instances, however, some form of electrical drive will prove more economical, and in addition, will provide a highly flexible control and a simpler mechanical arrangement. One of the most promising of the electrical drives, and one that has recently seen consider-

able development, is the direct-current adjustable-speed drive.

This drive, which provides a wide range of speed control, has commonly been known as the variable-voltage or Ward-Leonard type of drive. The term "adjustable voltage" is really more descriptive of the system, and since certain standardizations in terms are now being made, that term will be used in further reference to

Fig. 1. In This Conventional Adjustable-voltage Drive, the Speed Range is Usually Limited to 10 to 1. Introduction of Field Control Extends This Range to 40 to 1 for Some Applications

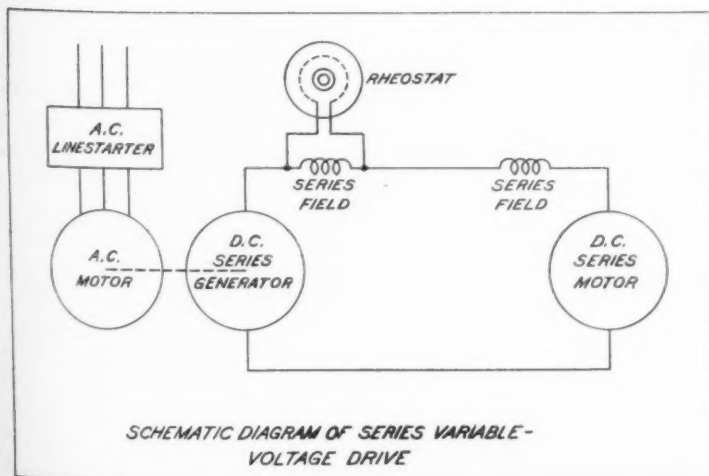
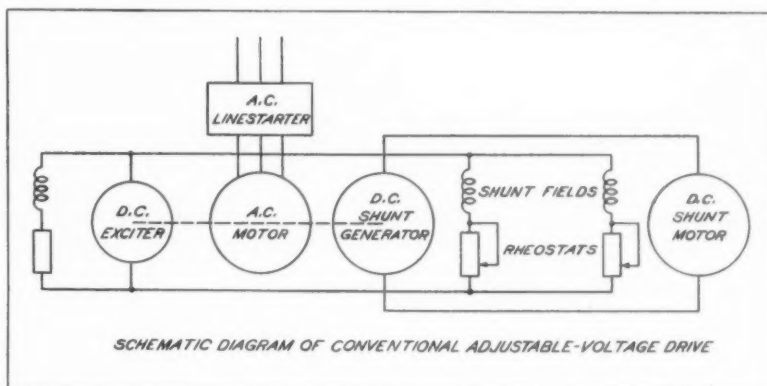


Fig. 2. No Separate Exciter is Required in This Series Variable-voltage Drive. The Usual Speed Range is 10 to 1, but One-twentieth of the Maximum Speed is Obtainable during Short Periods for Performing Threading or Inching Operations

this system. The adjustable-voltage type of drive has had the reputation of being elaborate, costly, and only practical for the larger and more complicated type of machine tools. However, recent developments have greatly simplified this scheme of control, so that the cost now compares very favorably with that of any other type of control.

The direct-current adjustable-voltage drive, in its many forms, consists of a group of units, with the basic unit a direct-current commutator type driving motor. The speed of this motor can be varied by a combination of field control on the motor and voltage control applied to the armature on the motor. Since each of the different forms of this drive requires an adjustable-voltage direct-current source, some form of conversion unit, such as a motor-generator set or a rectifying device, for transforming alternating current to direct current is required.

While five forms of this direct-current drive have been utilized, only one of these can be considered as generally known to the machine tool industry. These five forms are (1) *series variable-voltage*; (2) *self-excited adjustable-voltage*; (3) *conventional adjustable-voltage*; (4) *electronic adjustable-voltage*; and (5) *wide speed range adjustable-voltage*.

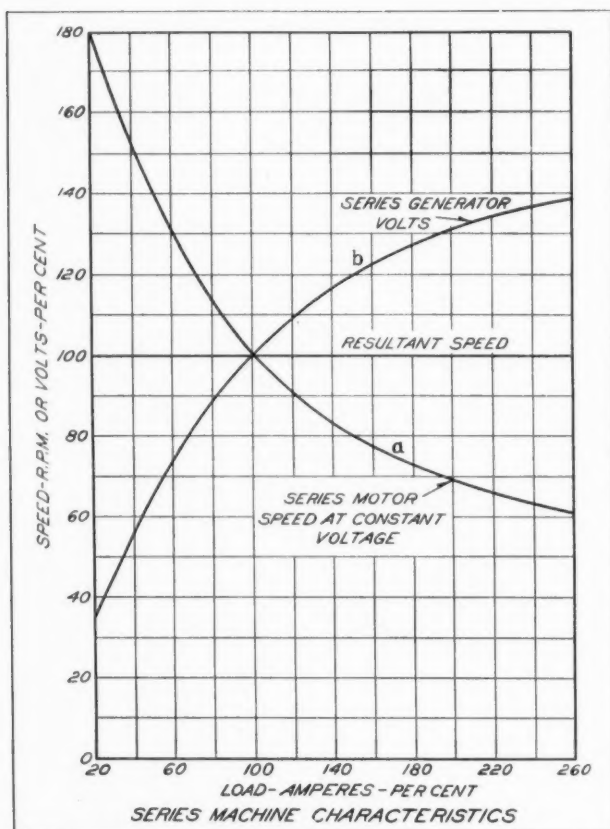


Fig. 3. By Using a Series Generator with a Voltage-Load Curve that is the Inverse of the Speed-Torque Curve of the Accompanying Series Motor, a Theoretically Constant Motor Speed is Obtained throughout the Load Range

The five forms have been listed in the order of their relative simplicity and cost, the series variable-voltage being, as a rule, the cheapest, and the wide speed range drive the most expensive. However, as the conventional adjustable-voltage is the type most widely known, this will be briefly described first, and then variations of this drive will be discussed.

### Conventional Adjustable-Voltage Drive

The conventional adjustable-voltage drive, as shown in Fig. 1, consists of a standard shunt-wound direct-current motor, a standard shunt- or compound-wound direct-current generator, and a separate direct-current source of excitation for both the generator and the motor. The excitation source is usually a separate unit on a motor-generator set, although it can be any form of rectifying device that will supply a suitable source of direct-current power. The main generator and exciter, as a rule, are built into a motor-generator set that is driven by an alternating-current squirrel-cage induction motor.

With this type of drive, it is considered good practice to limit the amount of speed range by means of voltage control to 10 to 1, as the speed regulation becomes excessive at the low speeds and the drive has a tendency to stall on overloads. On many applications, however, it is also possible to introduce a speed range of 4 to 1 by field control, so that the total speed range may be as high as 40 to 1.

The conventional adjustable-voltage type of drive was originally developed and used for large electrical equipment, where it was necessary to have frequent starting and stopping and where it was impractical to try to open the main armature circuits of the large motor equipment. The flexibility of this system, the speed range obtainable, and the ability to use alternating-current power for a source of supply has caused it to be gradually extended to smaller sized motors. It is now commonly used for motors rated as low as 1 H.P. In these small sizes, the control equipment and the exciter make up a large portion of the total cost of the drive, whereas in the large equipments, this portion of the drive is a very small percentage of the total cost. To make the drive more economical in the small sizes, many attempts have been made to simplify the control equipment and to eliminate the exciter. This has now been successfully accomplished.

### Series Variable-Voltage Drive

The simplest form of drive yet developed is the series variable-voltage drive, shown diagrammatically in Fig. 2. The only control equipment required consists of a line starter, with its start and stop push-buttons for the motor-gen-

erator set, and a speed-adjusting rheostat. The exciter is eliminated by using a series-wound direct-current motor and generator, and the control circuits are operated from the alternating-current power supply.

The series motor has a very fine reputation as a simple and reliable motor, and is used extensively on heavy-duty cranes and hoists, steel mill auxiliaries, and street railways. It is rarely used in machine tool applications because of its tendency to run away at no load. The speed-torque curve, when it is energized from a constant-voltage direct-current source, is shown at *a* in Fig. 3.

A series generator has a voltage-load characteristic that is similar to the series motor speed-torque characteristic, with the exception that it is inverted. Its characteristic curve is shown at *b* in the diagram. When a series generator is used to supply power to a series motor, the low voltage of the series generator applied to the motor armature at light load holds down the inherent high, no-load speed of the series motor. The high voltage of the generator applied to the motor armature at heavy loads increases the speeds of the series motor at these loads. The resultant theoretical speed-torque curve of the system is indicated by the straight line in Fig. 3.

While this ideal is never achieved, the actual results obtained are shown in Fig. 4. The top curve shows the speed-torque characteristic obtained with both the motor and generator operating at full field. By shunting the generator field, various speeds can be obtained with corresponding speed-torque curves, as indicated in the diagram. It will be noted that the speed-torque curves at the lower speeds are practically flat, except for the rather abrupt increase in speed obtained at very light load.

While the theoretical speed regulation of the drive is rather high, on the basis of the difference in speed between actual full-load speed and no-load speed, for all practical purposes, on most drives, the speed regulation is good, because there is sufficient friction load in the machines to insure that the increase in speed at no load is never obtained. This drive still maintains the inherent characteristics of a series motor of high starting torque. With the rheostat set for one-tenth of the maximum speed, the drive will have a starting torque of at least five times full-load torque. It would not be necessary, therefore, to "over motor" a job to secure the required starting torque.

While this drive is normally used for a 10 to 1 speed range at continuous duty, it can be operated as low as one-twentieth of the maximum speed and still have good speed characteristics, as shown by the bottom curve. This low speed can be used for short periods for threading or inching operations.

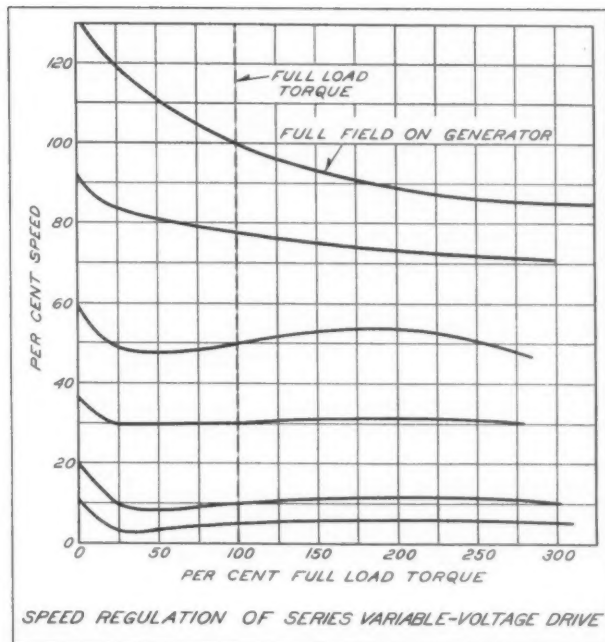


Fig. 4. Actual Speed-Torque Curves of a Series Variable-voltage Drive Show Some Speed Variation at Light and Heavy Loads. Each Curve Represents a Different Speed Setting of the Drive

In its simplest form, as shown in Fig. 2, the drive is actuated by starting the motor-generator set. This gives a very "soft" start, for as the motor-generator set accelerates, it causes the series generator to build up its voltage and to gradually increase the torque on the direct-current driving motor. Stopping is accomplished by stopping the motor-generator set, which, in turn, allows the drive to drift to a stop. This is satisfactory for many applications, and is actually a desirable characteristic for some.

In other cases, it is necessary to have a quick stop, and for these, dynamic braking can be added. One circuit used for dynamic braking is shown in Fig. 5. The motor is disconnected from the generator, and the series motor fields are reversed and connected across the motor armature with a resistor in series. This self-energizing type of dynamic braking is effective down to about one-sixth full field speed, at which point only one-thirty-sixth of the original energy remains, and a load with any appreciable amount of friction will stop quickly from that point. This scheme is used on the smaller sized drives, and requires the use of two two-pole magnetic contactors or a single contactor with two normally open circuits and two normally closed circuits.

A second method of obtaining dynamic braking is shown in Fig. 6. The series motor is equipped with a special braking field. To stop the motor, it is disconnected from the generator, and the braking field is connected across the motor armature terminals. Thus a braking effect

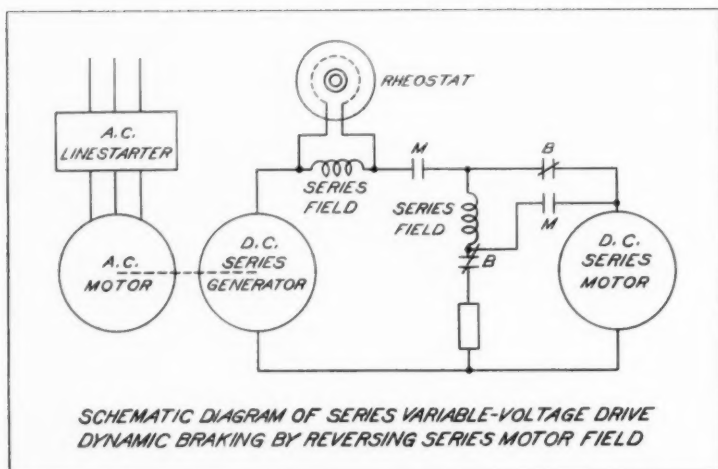


Fig. 5. Arrangement of Series Variable-voltage Drive for Dynamic Braking by Reversal of Motor Field. Without Dynamic Braking, the Drive is Stopped by Shutting off Motor-Generator Set

similar to that caused by reversing the series field of the motor is obtained. This arrangement is used on the larger sized units, where there is sufficient room in the motor to include the additional field, and results in a simpler scheme of control.

When dynamic braking is used to stop the motor, it is normal practice also to stop the motor-generator set, and then make a start as previously described. It is not desirable to line-start the series motor on the generator, although exceptions to this can be made where the equipment has a light load to start or where a smaller sized unit is used that has inherently enough circuit resistance to limit the starting current.

If it is undesirable to stop the motor-generator set when the equipment is dynamically braked, two other methods are available for re-starting the series motor. The first is by means of the conventional direct-current accelerating contactors, with which the motor can be brought up to the preset speed, and the second involves placing an interlocking plate on the rheostat, so that the rheostat must be brought back to some predetermined low speed setting where the equipment will line-start satisfactorily. Inching, slow-down, reversing, and other control features

can be obtained with this type of drive by adding the necessary control equipment. Inching can be done up to one-quarter speed, regardless of the size of the equipment.

#### Several Motors Operated by One Generator

Many other special control features have been worked out. One example consists of using two or more motors with a single generator. This can be done under certain circumstances. For instance, on a conveyor where it is desirable to have a low input at several points, all the motors can be placed in series across one generator. Since the motors are mechanically connected through the conveyor, they will divide their load equally. Also, a generator may be made to do double duty, that is, to operate any one of several motors, one at a time. In such cases, all the motors should have the same voltage and current rating, since the generator is designed to operate satisfactorily with a given size motor, and that operation would be impaired if different motor sizes were connected to the generator.

The series variable-voltage drive was conceived a few years ago by Westinghouse, and

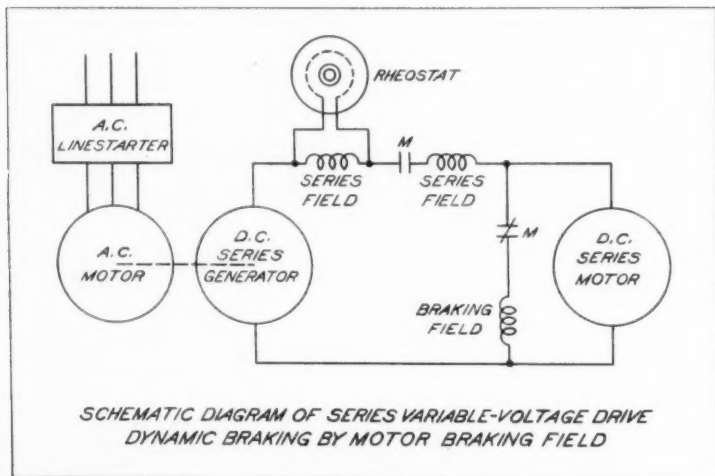


Fig. 6. Another Dynamic Braking Arrangement for Series Variable-voltage Drive in which a Special Motor Braking Field is Used

was developed in cooperation with the Landis Tool Co. as a simplified drive for the headstock of the various types of grinders built by that company. This development has proved very satisfactory, and a large number of units are now operating in the field.

The original development was largely with motors of fractional-horsepower size, but since that time, a complete line of units has been developed up to 15 H.P., and units have been applied to a wide variation of drives. All the units are essentially standard pieces of apparatus, the operation of which can be easily mastered by anyone accustomed to handling the electrical equipment normally used on machine tools.

The rheostat is the chief factor limiting the size of equipment that can be built economically. Since the rheostat is connected in shunt with the generator series field and must shunt up to 95 per cent of the current from that field at the low operating speeds, then the value of resistance in the rheostat at that point, including leads, must be less than one-twentieth of all the field resistance.

In order to obtain the best results in the larger sizes, the rheostat should be mounted close to the motor-generator set, or else the wiring should be so arranged that the load resistance is in the generator field portion of the circuit rather than in the rheostat portion.

## Industry Needs a Courageous Post-War Platform

COMMENTING upon the editorial "Industry Needs a Courageous Post-War Platform," published on page 160 of March MACHINERY, a prominent engineer writes us emphasizing the importance of the ideas expressed. He points out that what is chiefly needed is a leader or a group of leaders of industrial prominence "who will not only light the torch and show the way, but who will keep the torch lighted until the issues are clearly fixed in the minds of the American people."

He further emphasizes that there is an urgent need for a line of action on the part of business and industry to counterbalance the activities of political and special groups that are endeavoring to gain everything for their groups without any regard for the welfare of the nation as a whole. The results of these activities in the past have, in his opinion, been wholly one-sided; unfortunately, the management of business and industry has not appeared to be the match of the leaders of these special groups.

"Government for the people," says our correspondent, "seems to have gone far astray. We are now the unwilling tools of the governing few, when our form of government really should insure that our representatives work for all—not for special groups."

"The body of men who would lay down a post-war platform to cover industrial problems and relations should consider also post-war reconstruction. I know that there are several committees working along these lines, but I feel that we need a different group of people, with a broader outlook and experience to undertake this work. The group I have in mind must exclude lawyers and all professional politicians. The group should be made up chiefly of industrial leaders and business men, engineers, and some outstanding educational leaders."

"The ideals of our form of government cannot

perish. We must make the necessary effort to retain all worthwhile conceptions and institutions. To sit back now, just waiting for someone else to do something will not bring results. I believe that we are dangerously close to losing the best governmental conceptions the world has ever known. Let us keep them."

Where are the men who can take the leadership in this crusade for retaining American conceptions and ideals in the post-war life of the nation?

\* \* \*

### Controlling Shifts with the "Shiftograph"

The "Shiftograph" is an instrument or slide-rule chart designed by the George S. May Co., 2600 N. Shore Ave., Chicago, Ill., for use in easily arranging the various shifts in an industrial plant. By simply turning a dial, the user can tell at a glance on what shifts certain crews will work, the days they work, and their days off.

The instrument provides for several different plans of work rotation in which all employees are treated alike, so that they may share equally in working on desirable and undesirable work-shifts. These charts are distributed free of charge by the George S. May Co. as a contribution to America's war effort.

\* \* \*

During 1942, the General Electric Co. paid in wages to its employees \$382,000,000, compared with \$257,400,000 in 1941, an increase of 48 per cent. The average number employed during 1942 was, of course, greater than in 1941, the number in 1942 being about 140,000 as against 109,700 in 1941.

# MATERIALS OF INDUSTRY

## THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

### Armco Develops Aluminized Sheet Steel

Aluminized steel is a new sheet metal developed by the American Rolling Mill Co., Middletown, Ohio, for use in products requiring exceptional resistance to heat and corrosion. This aluminum-coated sheet with a mild-steel base combines the surface qualities of aluminum with the strength of steel.

The corrosion resistance of the aluminized steel surface is equal to that of an aluminum sheet, and when exposed to corrosive attack, a tight oxide film forms on the surface. The surface metal is passive in most atmospheres, and resists "pin-holing."

Aluminized steel is claimed to withstand temperatures up to 1000 degrees F. without discoloration, and even at higher temperatures it resists severe oxidation. The aluminum coating will not peel or flake in moderate forming or drawing operations. Paint will hold better on aluminized steel than on ordinary galvanized sheets; yet for most uses, the unpainted surface is satisfactory. After the war, the sheet will

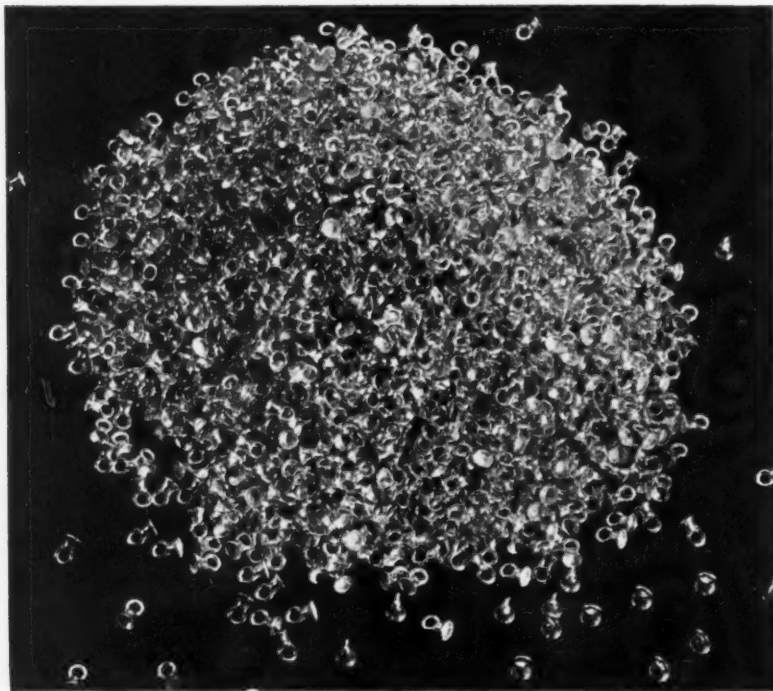
be available in a finish that can be buffed to a bright luster, giving an exceptionally good appearance, as well as reflectivity.

Although Armco aluminized steel has all the surface qualities of aluminum, a 16-gage sheet of the coated steel uses only 5 per cent as much of the lighter metal as a solid aluminum sheet of the same thickness.

Present aircraft applications include fire walls and air-intake filters. The new sheet is also being considered for cowling. ....201

### New Plastic Discoveries Counteract Material Shortage

Plastic compositions capable of replacing steel or other metals for many uses are now being manufactured by incorporating in various cellulose fibers a resin powder known as "Vinsol," extracted by the Hercules Powder Co., Wilmington, Del., from southern pine. This new structural resin plastic is an addition to the growing family of resin-treated laminated paper prod-



*View Showing a Pile of Button Shanks Produced by the Die-casting Process. This Part is One of the Smallest Zinc-alloy Die-castings Ever Made, and is Cast in an Entirely Automatic Machine. There are 4100 of These Shanks to the Pound. The Shanks are Assembled to the Buttons by Placing them in an Under-cut Recess in the Button and Using a "Deforming" Tool*

ucts. It is a thermoplastic fibrous resin composition that is hard, dense, stiff, and yet has a reasonable toughness. It is of light weight and has low water absorption. This new plastic is likely to be used in place of steel or other metals for food containers, automobile license plates, certain types of conduits, and cement-filled columns supporting light loads. It will doubtless find many other uses.

Another new discovery in the plastics field has been made by Elliott E. Simpson, who has developed a process that enables plastic materials to be used in place of rubber for such purposes as the soles of shoes and many other applications. In the new process, the plastic is "suspended" against a fabric, making it feasible to use it in many items where formerly crude or reclaimed rubber was used. The substitute material, which was first developed for shoe soles, has proved to have the resiliency, flexibility, and durability of rubber or leather....202

### Corrosion-Protective Treatment for Castings

A new method for protecting castings against corrosion and penetration by oils at temperatures under 150 degrees F. has been developed by Protective Coatings, Inc., 10391 Northlawn Ave., Detroit, Mich. In this method, known as "Pore-Pac," the casting is immersed in a solution of gums at about 350 degrees F. When the casting has reached this temperature, it is withdrawn from the solution and placed in an oven heated to 200 degrees F. This facilitates the

penetration of the protective gums into the surface pores of the casting. Samples treated by this method have been tested under a salt spray for periods of up to 264 hours without showing signs of corrosion.....203

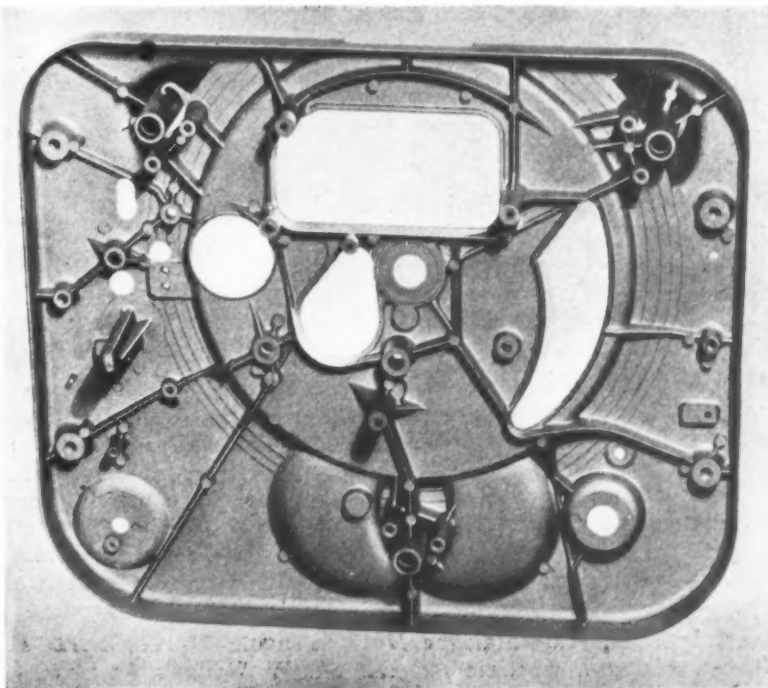
### New Adhesive Developed for Polishing Wheels

A new adhesive has been developed as a substitute for glue in facing polishing wheels by the Hanson-Van Winkle-Munning Co., Matawan, N. J. This material, called the H-VW-M adhesive, is used in the same way as glue, and is suitable for both coarse- and fine-grain wheels. It is supplied ready for use, and needs only to be heated and applied while warm. The unused material can be reheated without waste...204

### Thiokol Substitute for Rubber in Strip Material

A new strip material having the spongy characteristic of rubber strip, but utilizing the synthetic product Thiokol instead of rubber, has been announced by Felt Products Mfg. Co., 1530 Carroll Ave., Chicago, Ill. This material, called "Fel-Pro," is produced by applying Thiokol to a specially processed felt base. The strips, which are water-resistant, have been produced in lengths well over 6 feet. They are being used on Army vehicles for such applications as tail-gate molding, and are also finding numerous industrial applications. ....205

*A Large and Intricate Die-casting—the Base for a Phonograph Record Changer—which is 16 1/4 Inches Long. Unusually Great Dimensional Accuracy is Required in This Mounting Plate in Order to Insure Proper Working of the Automatic Record-changing Mechanism. Die-casting is Probably the Only Means of Economical Production of This Part in One Piece*



To obtain additional information about materials described on this page, see lower part of page 216.

# NEW TRADE LITERATURE

## RECENT PUBLICATIONS ON MACHINE SHOP EQUIPMENT, UNIT PARTS, AND MATERIALS

*To Obtain Copies, Fill in on Form at Bottom of Page 215 the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in the April Number of MACHINERY*

### Handbook on the Nichols Hand Miller

W. H. NICHOLS & SONS, 48 Woerd Ave., Waltham, Mass. Handbook showing how to get the most out of the Nichols hand miller, a precision machine for use in the tool-room, laboratory, or on the production line. Many sketches are included showing set-ups for various plain milling, end-milling, boring, facing, and turning operations, which should be of suggestive value in extending the field of usefulness of these machines. .... 1

### Machining Copper Alloys

AMERICAN BRASS CO., Waterbury, Conn. Booklet B-3, containing complete information on the proper procedure for machining copper and copper-base alloys, including cutting speeds, feeds, tool rakes and clearances, and cutting tool materials. Machinability ratings and tables of compositions, physical constants, and physical properties covering more than forty copper-base alloys are included. .... 2

### Wartime Conservation in Electrical Equipment

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa. Publication entitled "Wartime Conservation," containing recommendations for effecting savings of critical materials in the selection, application, and use of Westinghouse equipment, and at the same time getting more production from present equipment. .... 3

### Power Transmission Equipment

DODGE MFG. CORPORATION, Mishawaka, Ind. General catalogue No. 42, comprising a wartime manual

of mechanical power transmission. In addition to the descriptions, diagrams, and price lists covering thousands of power transmission appliances, the book contains over 100 pages of engineering data essential to proper design, installation, and operation of mechanical power drives. .... 4

### Clutch Service Manual

LIPE-ROLLWAY CORPORATION, Syracuse, N. Y. "Clutch Service Manual," containing complete information on the proper servicing of clutches, including instructions on when to make adjustments, how to adjust the clutch, installation and assembly, clutch rebuilding, replacing of parts, and special instructions for two-plate clutches. .... 5

### Metal Stamping Service

DAYTON ROGERS MFG. CO., 2835 Twelfth Ave. S., Minneapolis, Minn. Booklet entitled "Metal Stamping in Small Lots," describing the stamping service offered by this company to manufacturers who require a limited number of metal stampings in small lots where the cost of conventional dies would be almost prohibitive. .... 6

### Electrical-Contacts Handbook

FANSTEEL METALLURGICAL CORPORATION, North Chicago, Ill. Handbook on electrical-contact engineering design, containing descriptions of contact metals, alloys, and powder metallurgy compositions, together with a contact selector chart, of aid in selecting the correct material for a given application. .... 7

### Milling Machines

LINCOLN MACHINE SPECIALTY CO., 549 W. Washington Blvd., Chicago,

Ill. Bulletin illustrating and describing the Lincoln Uni-Mill, designed to accommodate any make of high-speed milling head. Also describes the Eklind-Lincoln high-speed milling attachment for milling, drilling, or boring. .... 8

### Machining and Surface Treatment of Stainless Steels

OAKITE PRODUCTS, INC., 26 Thames St., New York City. Special report entitled "Fabrication and Surface Treatment of Stainless Steels," covering machining, grinding, drawing and forming, degreasing, descaling, and cleaning of stainless-steel parts. Cutting compounds and lubricants for various operations are recommended. .... 9

### Oxy-Acetylene Equipment Operation

AIR REDUCTION CO., 60 E. 42nd St., New York City. Chart for oxy-acetylene flame adjustment, showing, in colored photographs, five fundamental adjustments: (1) Acetylene burning in air; (2) a strongly carburizing flame; (3) slight excess of acetylene flame; (4) neutral flame; (5) an oxidizing flame. .... 10

### Nitriding

LEEDS & NORTHRUP CO., 4934 Stenton Ave., Philadelphia, Pa. Catalogue T-624, on the Homo method for nitriding, developed to give heat-treaters precise control of three important variables—nitriding temperature, flow and distribution of ammonia gas, and length of treatment. .... 11

### Chrome-Plating of Cutting Tools

CROWELL-COLLIER PUBLISHING CO., 250 Park Ave., New York City.

Booklet entitled "For Makers of War Materials," describing a special process of chrome-plating and treating the knife-edge of cutting tools which is claimed to have greatly increased the life of tools before regrinding is necessary. 12

### Increasing Production of Single-Cutter Bar-Turners

WARNER & SWASEY Co., Cleveland, Ohio. Booklet entitled "Better Performance from Single-Cutter Bar-Turners," giving helpful information on the set-up and operation of these tools, prepared to enable the operator of turret lathes to get the best performance from them. 13

### Welding and Brazing Aluminum

ALUMINUM CO. OF AMERICA, Pittsburgh, Pa. Revised edition of booklet entitled "Welding and Brazing Alcoa Aluminum," containing specific, detailed instructions on these processes, as well as suggestions for conserving aluminum and speeding up production. 14

### Crane and Hoist Maintenance Manual

SHEPARD NILES CRANE & HOIST CORPORATION, 444 Schuyler Ave., Montour Falls, N. Y. Maintenance and Operation Manual containing instructions for keeping Shepard Niles electric cranes and hoists in first-class operating condition. 15

### Machine Tools

CINCINNATI MILLING AND GRINDING MACHINES, INC., Cincinnati, Ohio. Catalogue M-995-1, 48 pages, 8 1/2 by 11 inches, covering the company's complete line of products, including milling machines, broaching machines, die-sinking machines, grinding machines, and lapping machines. 16

### Graphite Parting Compound

ACHESON COLLOIDS CORPORATION, Port Huron, Mich. Bulletin 422-YY, discussing the use of "Dag" colloidal graphite as a parting compound for screw threads, lamp bulbs, aviation and deep-sea diving equipment, as well as in the glass industry, the foundry, and the rubber industry. 17

### Increasing Welding Production

LINCOLN ELECTRIC Co., Cleveland, Ohio. Booklet entitled "Factors Affecting Increased Welding Production," containing information of aid in choosing the correct electrode, estimating speeds and costs of various welding jobs, and applying the most suitable welding technique. 18

### Electric Motors

DUMORE Co., Racine, Wis. Bulletin 120, entitled "Dumore Aircraft Motors," covering a line of electric motors from 1/50 to 1/4 H.P. that have been developed for various uses in aircraft, but that

are also applicable to many different types of industrial service. 19

### Gears and Speed-Reducing Units

PHILADELPHIA GEAR WORKS, Erie Ave. and G St., Philadelphia, Pa. Catalogue 42, containing 72 pages covering the company's line of gears, speed-reducing units, Moto-ReduceRs, and electric hoists. The catalogue also has a section of useful engineering data. 20

### Machine Tools and Attachments

JEFFERSON MACHINE TOOL Co., 673-773 W. Fourth St., Cincinnati, Ohio. Catalogue covering milling machines and milling machine attachments, lathe attachments, sanding machines, swing-frame grinding and polishing machines, and foundry riddles. 21

### Speed Reducers

WINFIELD H. SMITH, INC., Springfield, Erie Co., N. Y. Booklet entitled "There's More Than Meets the Eye in Speed Reducers," describing the facilities of this company for making speed reducers, and typical problems solved by the use of Smith speed reducers. 22

### Instruction Manual for Women Operators of Power Trucks

ELWELL-PARKER ELECTRIC Co., Cleveland, Ohio. Circular entitled "Lady—Will You Give a Lift?"

## To Obtain Copies of New Trade Literature

listed on pages 214-216 (without charge or obligation), fill in below the publications wanted, using the identifying number at the end of each descriptive paragraph; detach and mail to:

**MACHINERY, 148 Lafayette St., New York, N. Y.**

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
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[This service is for those in charge of shop and engineering work in manufacturing plants.]

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[SEE OTHER SIDE]

containing instructions for women lacking previous mechanical training in the operation of industrial power trucks. .... 23

### Electrolimit Comparators

PRATT & WHITNEY, DIVISION NILES - BEMENT - POND Co., West Hartford, Conn. Circular 469, on Electrolimit external comparators; also covering Electrolimit height gages, snap gages, and gage-block comparator, as well as a mechanical external comparator. .... 24

### Contour Sawing Machines

DOALL SERVICE Co., 1201 Thacker St., Des Plaines, Ill. 265-page textbook on DoAll contour saws, containing a comprehensive study of the technique of contour machining and the cutting tools used, as well as the DoAll training program. 25

### Electronic Switches

UNITED CINEPHONE CORPORATION, Department H, Torrington, Conn. Specification Sheet D, on electronic switches applicable to precision machine tool operations—lathes, grinding machines, boring machines, etc.—as well as gaging. 26

### High-Speed Automatic Presses

DI MACHINE CORPORATION, DIVISION DIEBEL DIE & MFG. Co., 3654 Lincoln Ave., Chicago, Ill. Circular describing an improved model of the Diebel "Hi-Speed" automatic press, designed for the rapid production of small stampings. .... 27

### Chip-Breaker Chart

MCKENNA METALS Co., 147 Lloyd Ave., Latrobe, Pa. Chip-breaker chart, printed in three colors, for plants employing carbide tools. The chart shows dimensioned diagrams for the grinding of different types of chip-breakers. .... 28

### V-Belting

MANHEIM MFG. & BELTING Co., Manheim, Pa. Catalogue on Veelos adjustable V-belting entitled "Drive Production Higher with Veelos V-Belt." The catalogue also shows the construction and method of installation of Veelos belts. .... 29

### Superheat Burners for Flame-Hardening

SELAS Co., Erie Ave. and D St., Philadelphia, Pa. Bulletin 251-B, on Selas superheat burners for flame-hardening, flame-annealing, brazing, preheating, descaling, and other localized open heat-treatments. .... 30

### Aviation Seamless Metal Hose

ECLIPSE AVIATION, SEAMLESS FLEXIBLE METAL HOSE DIVISION OF BENDIX AVIATION CORPORATION, Philadelphia, Pa. Circular on seamless flexible metal hose for use in the aviation, automotive, marine, mining, and other fields. .... 31

### Ampco Metal

AMPCO METAL, INC., Milwaukee, Wis. Engineering Data Sheet No. 109, describing a new bronze

extrusion mill recently placed in operation by the company for extruding aluminum bronzes and other copper-base alloys. .... 32

### Installing and Leveling Lathes

SOUTH BEND LATHE WORKS, South Bend, Ind. Bulletin H-3, containing helpful information for lathe operators, millwrights, and plant superintendents on the installation and leveling of lathes. .... 33

### Milling Machines

SOMMER & ADAMS Co., 18511 Euclid Ave., Cleveland, Ohio. Bulletin on the No. 1 1/2 horizontal production milling machine. .... 34

### "Safe-Line" Wire-Rope Clamps

NATIONAL PRODUCTION Co., 4550 St. Jean Ave., Detroit, Mich. Circular describing the "Safe-Line" wire-rope clamp. .... 35

### Check-Valves

WATSON - STILLMAN Co., Roselle, N. J. Bulletin A-4, containing data on the globe and check valves made by this company. .... 36

### Motor Control

GENERAL ELECTRIC Co., Schenectady, N. Y. Bulletin GEA-1724D, describing GE synchronous-motor controls. .... 37

### Die Steels

JESSOP STEEL Co., Washington, Pa. Bulletin 742, on C.N.S. air-hardening die steel. .... 38

## To Obtain Additional Information on Shop Equipment

Which of the new or improved equipment described on pages 222-238 is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equip-

ment, fill in below the identifying number found at the end of each description—or write directly to the manufacturer, mentioning machine as described in April, 1943, MACHINERY.

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## To Obtain Additional Information on Materials of Industry

To obtain additional information about any of the materials described on pages 212-213, fill in below the identifying number found at the

end of each description—or write directly to the manufacturer, mentioning name of material as described in April, 1943, MACHINERY.

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[SEE OTHER SIDE]

# USE YOUR ARBORS PROPERLY

— to help speed  
production



It takes the best utilization of arbor equipment for cutters and machines to achieve maximum production. Do all in your power to keep these vital tools in service when replacement is so difficult.

Follow these simple precautions to keep them on the job —

**BEFORE INSERTING** any arbor in a machine, clean dirt or chips from the shank and from the machine taper hole — thereby assuring proper seating. This provides a true drive. It's a must to obtain accurate work and prevent excessive cutter wear.

**CLEAN THE FACES** of the sleeves and bushings to provide accurate running.

**BE SURE** arbor is well supported and of ample diameter.

**ALWAYS** use a cutter driving key to prevent slippage and consequent damage to cutter, arbor, or work.

Except on very short arbors and those of Shell End Mill type, **DO NOT TIGHTEN** the arbor nut until the arbor is supported by a yoke. Such abuse results in distorted arbors.

**BE CAREFUL** not to run the work or some part of the machine into an arbor. Such action may spring it and cause damage to cutting tools.

**WHEN NOT IN USE**, arbors should be kept in racks where they may be found easily and not subject to injury from other heavy or sharp tools.

Your conservation of arbors will help you do more and better work and will result in increased cutter efficiency and longer machine life. It's **another** way to help in the united war effort.



Reproductions of this advertisement for use on your bulletin board furnished on request.

# BROWN & SHARPE

# Free-Machining Invar Alloy

THE use of the 36 per cent nickel alloy known as Invar has been considerably limited in the past by machining difficulties. This problem has now been solved by the Carpenter Steel Co., Reading, Pa., through the development of a free-machining grade of Invar. The free-cutting property will greatly facilitate the use of this alloy which, due to the fact that it has a rate of thermal expansion only about one-tenth that of carbon steel at temperatures up to 400 degrees F., fills an important place in radio and electronic devices, aircraft controls, thermostats, etc. The name given to the new free-machining alloy by its producer is Carpenter Free-Cut Invar 36.

While regular Invar bar stock is extremely difficult to machine, the new type is claimed to machine easily, at a saving of as much as 72 per cent in machining time. The addition of selenium to the alloy provides the free-cutting property; yet it does not alter the low thermal expansion characteristic of the metal. Anyone familiar with the trouble experienced in ma-

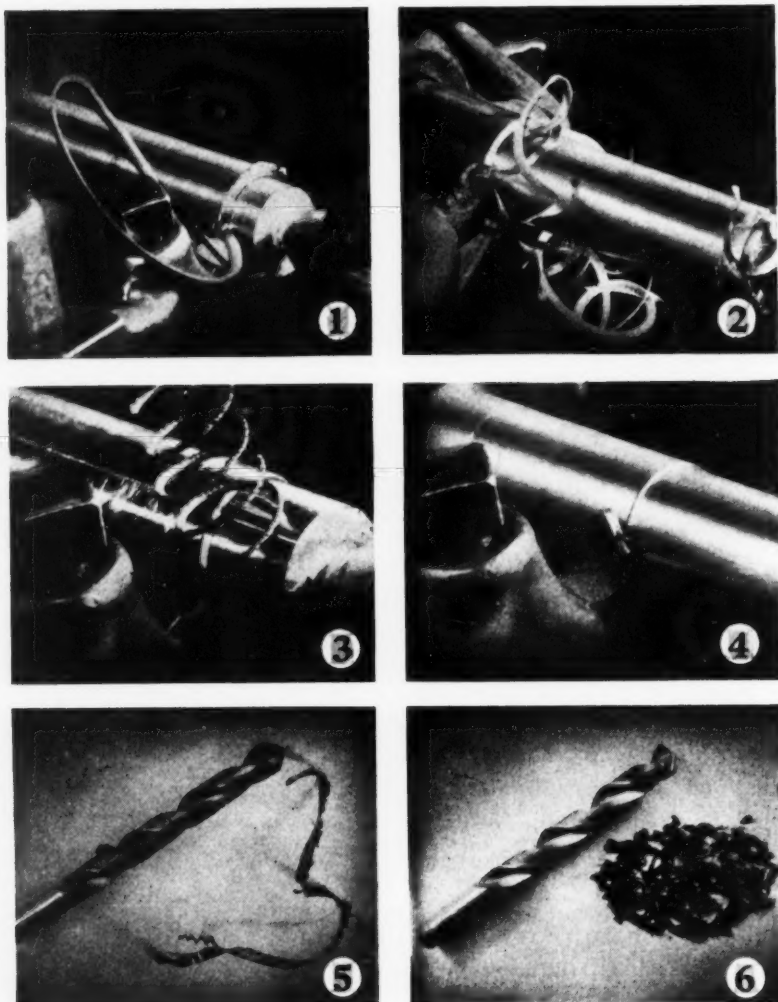
chining 18-8 stainless steel before the free-machining type came into use will have an idea of the difficulties involved in machining the regular type of Invar bar stock, since, actually, 18-8 stainless steel is easier to machine than regular Invar.

To demonstrate the new alloy's free-machining properties, comparative tests were made on bars of both regular and free-machining Invar. In these tests, standard high-speed steel cutting tools were used, ground with standard angles. In all cases, the machines and tools used for making these tests were identical. A few of the results obtained in these comparative tests will prove of interest.

The test bars being turned were 1 inch in diameter. A roughing cut was taken with a 3/32-inch depth of cut and a feed of 0.0055 inch. In machining regular Invar at a cutting speed of approximately 82 feet per minute, the tool failed after only a few revolutions. In machining Invar 36 at the same speed, no effect was noticeable on the tool. The speed was then increased to approximately 137 feet per minute, and still there was no indication of failure. Then the feed was increased to 0.0125 inch, using the same speed, and the results still were satisfactory.

Finishing cuts were taken with a feed of 0.0055 inch and a depth of cut of 0.050 inch. In machining regular Invar, a speed of about 23 feet per minute provided the best possible finish. In taking the same cut on Invar 36, the speed was increased to approximately 112 feet per minute, and a very good finish obtained; then the feed was increased to 0.0125 inch, and the finish still remained good. This comparative test was made simply to determine the highest speed possible with each of the alloys for obtaining a satisfactory finish.

For the drilling tests, a test block 2 3/16 inches thick was used in which were drilled holes 7/16



Figs. 1 and 2. Rough-turning Operation on Regular Invar and on Carpenter Invar 36, Respectively. Fig. 3. Finishing Cut Taken on Regular Invar. Fig. 4. Same Cut as Shown in Fig. 3 being Taken on Free-machining Invar. Figs. 5 and 6. Chips Produced when Drilling Regular Invar and when Drilling Free-machining Invar, Respectively

Cincinnati Shapers

## RAPID TRAVERSE SHAPERS

These shapers are more than shapers. They are rapid traversers. The Cincinnati Rapid Traverse Shaper is built for the most efficient use of the table.

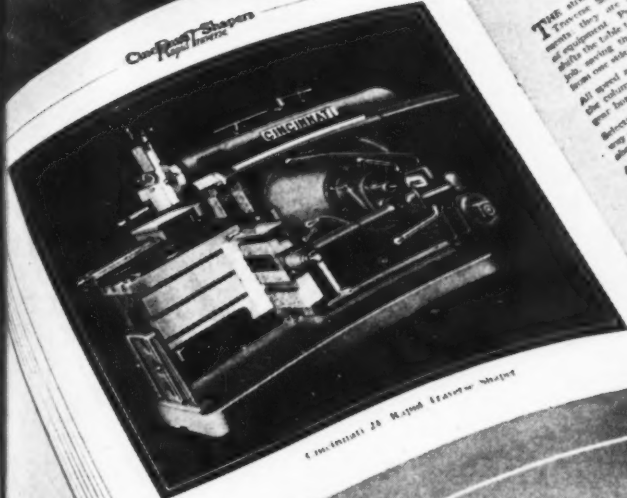
It is designed with the machine in mind. It is built to be used in the shop. It is built to be used in the shop. It is built to be used in the shop.

Full length type with single stroke adjust. It is built to be used in the shop. It is built to be used in the shop. It is built to be used in the shop.

The machine is built to be used in the shop. It is built to be used in the shop. It is built to be used in the shop.

One story only is required for the machine. It is built to be used in the shop. It is built to be used in the shop. It is built to be used in the shop.

These shapers are built to be used in the shop. It is built to be used in the shop. It is built to be used in the shop.



Cincinnati 20 Rapid Traverse Shaper

# INFORMATION, PLEASE



Today, as ever, Cincinnati Shapers are indispensable in both the large plant and the small shop. Such Cincinnati features as: built in power rapid traverse to the table, multiple cam feeds, direct reading indicators, bring to the user of a single machine or of many machines an outstanding usefulness.

Write for informative book N-2 on the complete line of Cincinnati Shapers.

## THE CINCINNATI SHAPER CO.

CINCINNATI OHIO U.S.A.

SHAPERS • SHEARS • BRAKES

inch in diameter with high-speed steel drills. The feed used was 0.004 inch per revolution. In drilling regular Invar at 665 R.P.M., the drill failed completely when the hole was only 1 1/16 inches deep. In drilling Invar 36 at the same speed, the drill went through the entire thickness of the test block with ease, and after the test, the drill was still in good condition.

In cutting threads with a single-point tool, ten threads per inch, two roughing cuts were taken about 0.040 inch deep, and two finishing cuts approximately 0.004 inch deep. The speed was 60 R.P.M. for the regular Invar. At this speed, the two roughing cuts resulted in torn threads; the two finishing cuts failed to provide satisfactory threads. Invar 36 alloy was cut at 188 R.P.M., with roughing and finishing cuts the same as for the regular Invar. The threads at this high speed were greatly superior to those on the regular Invar sample at the lower speed. These tests were made to determine the highest speed feasible to obtain the best possible threads.

The accompanying illustrations show actual results obtained in machining the two alloys. Fig. 1 shows a rough-turning operation on a bar of regular Invar, while Fig. 2 shows the same operation on the new free-machining grade. Note the burred edges produced in machining regular Invar. Fig. 3 shows the chips produced in taking a finishing cut on regular Invar, and Fig. 4 shows the results obtained in machining Invar 36. Fig. 5 shows a chip resulting from drilling regular Invar, and Fig. 6 the chips produced in drilling Invar 36. The drill shown in Fig. 5 is also badly burned.

\* \* \*

## Making the New Worker Feel at Home

One of the difficult problems confronting the industrial manager at the present time is that of finding an effective method of making the new employe feel at home in his new surroundings. This is particularly true when women who have never previously been engaged in factory work are hired to work in a machine shop. Some companies have found that during the first few days or weeks the new employes become frightened and quit. It is of importance that they be made to feel at home as soon as possible.

The Armstrong Cork Co., Lancaster, Pa., has taken a long step toward the solution of this problem. The company has prepared two motion pictures, one known as "This is Armstrong's" and the other "Welcome to Armstrong." The first of these pictures gives a detailed history of the development of the Armstrong organization from its very beginning in 1860, while the other

gives the employe a clear insight into the methods used in the Armstrong plant for looking after the welfare of the employe. It also shows the man or woman who is beginning to work for Armstrong that, in this organization, the employe is not a mere number, but that the company maintains a careful record of his or her progress in the work, a record that becomes useful in deciding upon promotions.

After the employes have been hired and the usual formalities—such as photographing, finger-printing, health examination, etc.—have been attended to, the new employes are invited to view these motion pictures in a quiet, peaceful atmosphere. The showing of the pictures takes about two hours, during which the new employe can relax and begin to feel at home. It is believed that this scheme will be of considerable assistance in reducing the labor turnover of newly hired workers.

\* \* \*

## Sawing Operations on NE Steels

The following information relating to sawing of National Emergency steels Nos. 8024 and 8949 has been furnished by the DoAll Co.

First, a high-grade saw should be used—one that has the requisite depth of tooth hardness, so that the set will be retained and the teeth will not be stripped when the saw is subjected to severe service.

Kerosene has proved to be the best coolant for this operation, and should be applied by the drip method, with the flow regulated to about forty-five drops per minute. A "raker set" saw of "A" temper is the best saw to use. For straight cutting, a saw 1 inch wide is recommended for all thicknesses of metal over 2 inches, and a 1/2-inch saw for thicknesses under 2 inches. When a curved cut is required, use the widest saw possible consistent with the contour to be sawed.

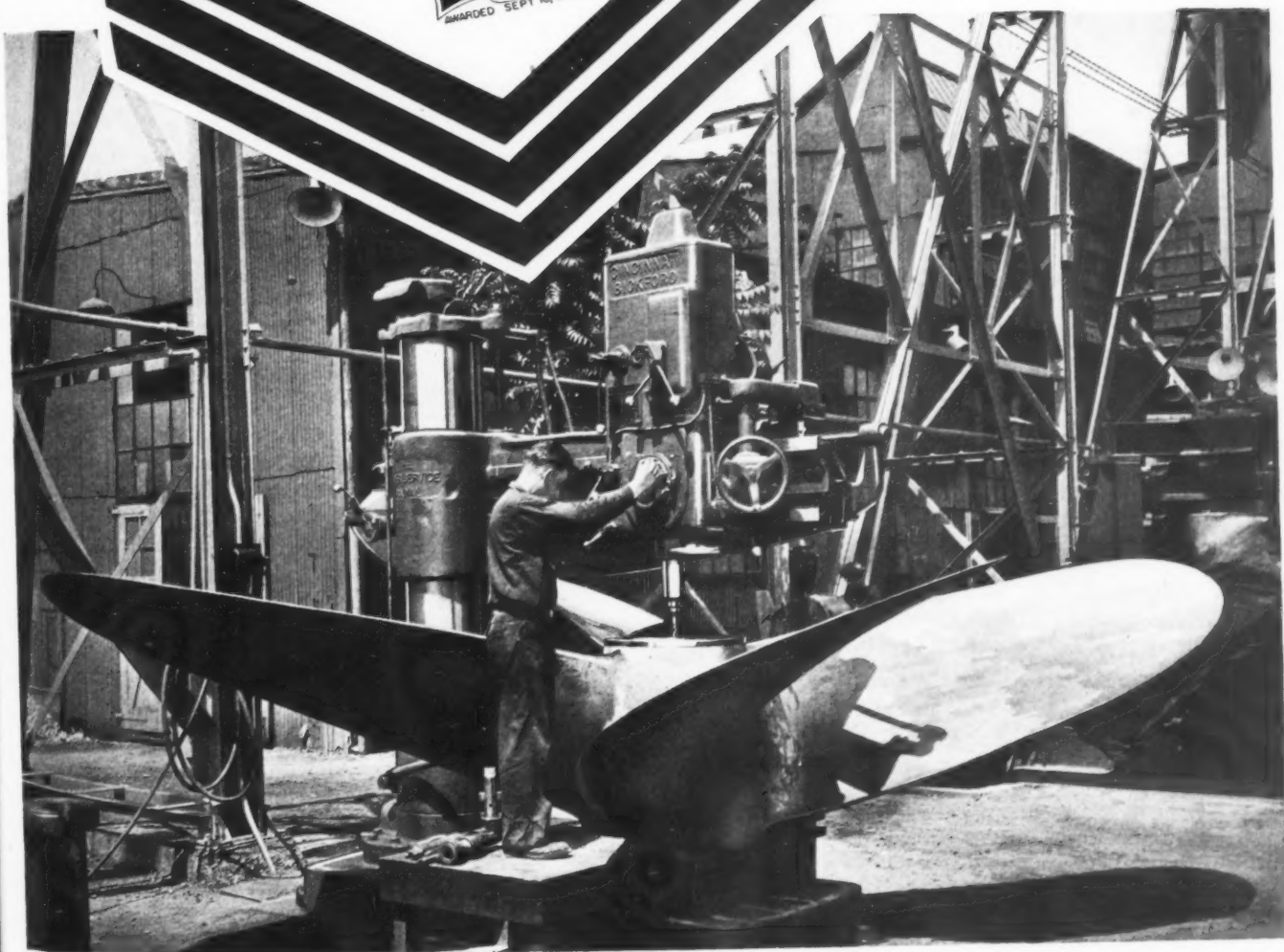
The cutting rate should average from 1.25 to 1.75 square inches per minute. The best cutting rate has been obtained in sawing material 3 1/2 to 4 inches thick with a 1-inch wide, six-pitch saw operating at a cutting speed of 150 feet per minute. The tabulation below gives the results of about seventy-five tests on various National Emergency steels:

Material Thickness, Inches	Saw Pitch	Saw Velocity, Feet per Minute	Feeding Pressure
1/16 or less	24-32	225	Light (hand)
1/16 to 1/2	24-14	200	Light (mechanical)
1/2 to 1	14-8	175	Light-Medium
1 to 2 1/2	8	150	Medium
Over 2 1/2	6	150-125	Medium-Heavy

# PROPELLERS

In a well known eastern plant, war orders for Liberty Ship and Tanker propellers required fast retooling. Before a building could be erected for this work, propellers were in production—as attested by this outdoor setup. The machine is an early type Super Service Radial, applied to the drilling and tapping of 12 holes in the hubface. Precision locating from the keyway was specified, and a circular drill jig insured accurate center-to-center distances of all stud holes. Super Service Radials are applied to countless similar precision war jobs, often performing yeoman service 3 shifts per day, 7 days per week. The Super Service Radial's productivity, capacity, adaptability, reliability, accuracy and convenience are features of inestimable value to the war effort. Detailed information upon request. The Cincinnati Bickford Tool Co., Oakley, Cincinnati, Ohio.

## SUPER SERVICE RADIAL



# Shop Equipment News

*Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market*

## Liberty Double-Housing Medium-Duty Planer

A medium-duty, 48- by 48-inch planer has just been placed on the market by Liberty Planers, 1007 Weller Ave., Hamilton, Ohio. This planer is designed to meet the needs of shops having work that cannot be handled efficiently on small standard type planers, yet does not require the use of heavy-duty, elaborately equipped machines. The double-length bed is composed of three sections, the center section being of standard length, while the end sections can be obtained in different lengths to suit requirements.

The drive is through a triple-reduction gear train with steel high-speed herringbone primary drive gears, and semi-steel secondary spur gears. Heavy shafts, running in oil-lubricated bronze bearings, support the gearing. All gears run in a bath of oil and are easily accessible. The cross-rail can accommodate two heads, allowing either head full rapid traverse across the table. Elevating screws are adjustable from the top, and are supported by ball bearings,

permitting easy, smooth up and down movement of the rail. The feed-box mechanism, with its individual motor, is mounted at the right-hand end of the rail.

A new type elevating device, self-contained, with integrally mounted individual motor, is located on top of the housing cross-brace. The rail-heads are graduated for swiveling up to 90 degrees, and have four-way power feed and power rapid traverse, manual operation being possible from either end of the rail. Micrometer adjustments are provided on all vertical and horizontal feed-screws. Automatic air type tool-lifters are standard equipment for the rail-heads. The

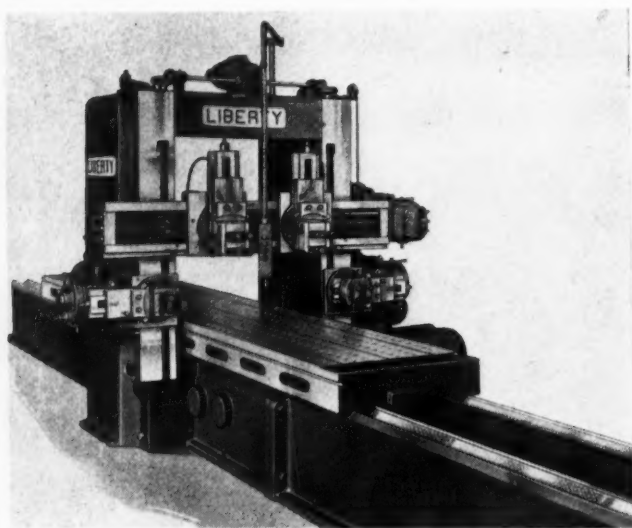
side-heads are graduated for swiveling 45 degrees. Both the rail- and side-heads are equipped with electrically operated, oil-immersed, friction feeds.

The planer is available with tables 12, 16, or 20 feet in length, and in over-all lengths of 27, 35, and 43 feet. These machines weigh approximately 50,000, 56,000, and 62,000 pounds. The maximum width between housings is 49 inches, and the maximum height under the cross-rail is also 49 inches. A 30-H.P., direct-current, variable-voltage, reversing drive motor, with generator set, operates at speeds of from 40 to 1200 R.P.M. This provides a range of table feeds of from approximately 5 to 150 feet per minute. 51

## General Automatic Multiple Riveter

An automatic multiple riveter (Model G-3000), which is adapted for the riveting of a wide variety of work, including the heaviest types of airplane assemblies, has just been brought out by the General Engineering Co., 785 Hertel

Ave., Buffalo, N. Y. Difficult jobs, such as riveting heavy aircraft spars or wing-skin sections that are usually riveted by hand, can be placed on the light handling frames or run directly through this machine automatically on the simple



Liberty Double-housing Medium-duty Planer Built in Three Different Bed Lengths



Automatic Multiple Riveter Brought out by the General Engineering Co.



## BUILT FOR 24-HOUR SERVICE!

The Ex-Cell-O Precision Boring Machine is designed and built to "take it", every hour of the day, every day of the week. Moving parts, such as spindles, drive units, braking equipment, are located on bridges above the work table. These bridges, coupled with heavy base and reinforced table, provide a precision machine that is exceptionally solid and firm. Boring units are easily accessible so that adjustments and changes are a simple matter for the operator. The Ex-Cell-O name on a precision boring machine means not only a precision-built machine to do precision work, but a machine tool that gives the utmost in efficiency with a minimum in maintenance attention.

**EX-CELL-O CORPORATION • DETROIT**

Below: No. 215-A—one of nine different styles of Ex-Cell-O Precision Boring Machines . . . for boring, turning, facing.



**XLO**

EX-CELL-O means PRECISION

*Precision* THREAD GRINDING, BORING AND LAPPING MACHINES • TOOL GRINDERS • HYDRAULIC POWER UNITS • GRINDING SPINDLES • BROACHES • CONTINENTAL CUTTING TOOLS • DRILL JIG BUSHINGS • DIESEL FUEL INJECTION EQUIPMENT • PURE-PAK CONTAINER MACHINES • R. R. PINS AND BUSHINGS • PRECISION PARTS

roll stands. Automatic control setups involve only the quick attachment of a simple templet to one or two fixed points on the part to be riveted. Potential savings in manpower obtained through the use of this machine are claimed to run as high as 30 to 1 under actual tests.

The machine is adapted for use with the loading station system of production, as used in hydraulic press forming. Several loading crews can be employed in setting up assemblies in sequence while the machine is operating. Assemblies do not need to be the same, as the templet attached to the part controls the machine operation. Rows of rivets running at an angle or on a curve, such as found on taper wing spars or bulkheads of aircraft, can be automatically

headed. The riveting heads of the machine can be used either together or individually. It is claimed that, owing to the precision handling of parts on the motorized rolls and the shockless heading of rivets, no distortion is produced in the heaviest and most complicated assemblies.

Two riveting units, with hydraulic cylinders, each capable of exerting a maximum force of 56,600 pounds, are mounted on ways in the lower part of the machine frame. Each unit has a capacity for heading six 1 1/4-, nine 3/16-, or fifteen 5/32-inch diameter aluminum-alloy rivets. The riveting rams have an upward speed of 60 inches per minute, and a return speed of 120 inches per minute. The total travel of the rams is 6 inches. 52

### Reeves Combination Variable-Speed Mechanism and Gear Reducer

A variable-speed mechanism and gear reducer, combined to form a single compact reducer type transmission, is a new addition to the line of variable-speed control equipment built by the Reeves Pulley Co., Columbus, Ind. This drive consists of the standard Reeves variable-speed transmission with a built-in speed reducer. With this arrangement, far less mounting space is required to obtain the lower range of speeds than with the auxiliary speed-reducing equipment previously available.

This reducer type transmission is available in two enclosed de-

signs, one horizontal and the other vertical. These transmissions can be mounted in any convenient position. Each design is available in a wide range of speeds and in capacities from 1 to 7 1/2 H.P., inclusive. The transmission, in its various sizes, provides ratios of speed variation from 2 to 1 through 12 to 1, and the reduction gears provide ratios up to and including 6.9 to 1. Speed changes are obtained by turning a hand-wheel, or if completely automatic regulation is desired, it can be obtained by mechanical or hydraulic means. 53



Reeves Variable-speed Mechanism and Gear Reducer



Fig. 1. Jefferson "Bulldog" Precision Milling Machine

### "Bulldog" Precision Milling Machines and Swivel-Base Dividing Head

The Jefferson Machine Tool Co., 673-773 W. Fourth St., Cincinnati, Ohio, has just brought out an improved precision milling machine with hand feed, as shown in Fig. 1, and also in a power feed type. These machines are designed to combine fast, accurate production with ease of operation, and are especially adapted for performing

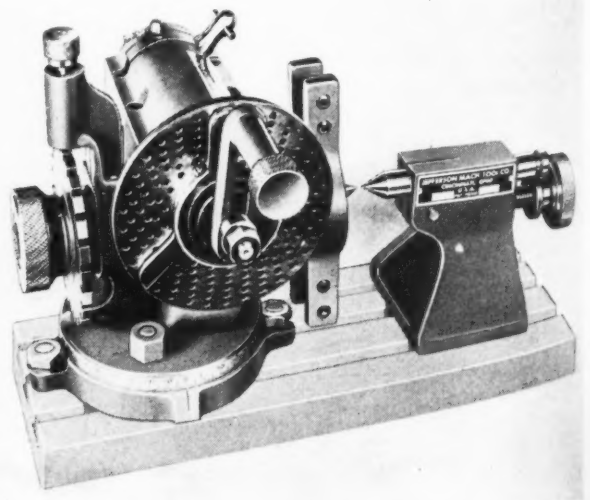


Fig. 2. Jefferson Swivel-base Dividing Head

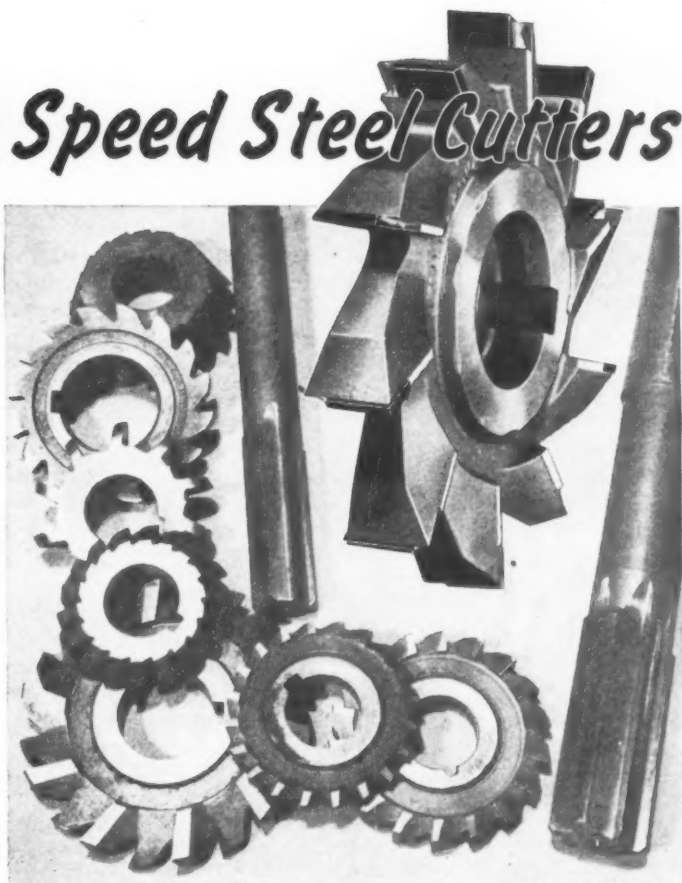
# Reclaim Your High Speed Steel Cutters

## By Brazing-on STANDARD CARBIDE BLANKS

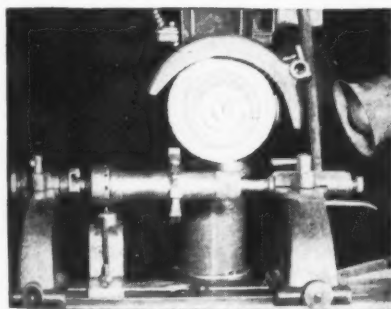
When your high speed steel cutters are "worn out", don't scrap them. They usually can be reclaimed by simply torch-brazing standard carbide tips to the cutting edges of your cutters.

Standard styles of carbide tips are readily available to meet practically all carbide tipping requirements for all commonly used types of high speed steel cutters. With a small master stock of standard tips in your crib, you'll be prepared to reclaim and re-tool fast.

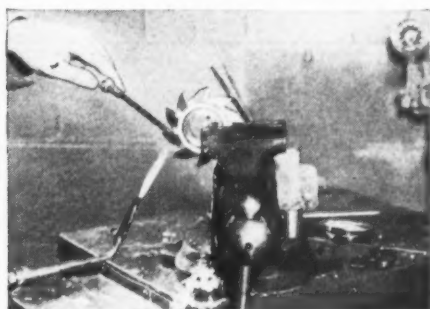
Complete instructions on request.



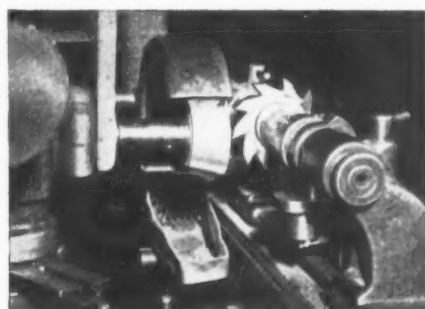
### THREE EASY STEPS AND YOUR OLD CUTTERS ARE RENEWED



**1** First grind a recess in the faces to which the carbide tips are to be brazed. Plan recess so that tips will project slightly over edge—for grinding back to size. Bottom of recess should be ground flat surface but not necessarily smooth.



**2** Using an oxy-acetylene torch, flux, and silver solder, braze standard carbide tips in place. Process is essentially the same as regular braze for carbide tools—except braze should be completed fast to prevent oxidization and loss of chrome.



**3** Grind carbide tipped "high speed steel" cutter in same way you regularly grind any carbide tipped cutter. Cutter is now ready for many times life of the original. When again worn, you can often resize using same process.

## CARBOLOY COMPANY, INC.

Sole makers of the Carboloy brand of cemented carbides

11147 E. 8 MILE STREET, DETROIT, MICHIGAN

Birmingham, Ala. • Chicago • Cleveland • Los Angeles • Newark • Philadelphia • Pittsburgh • Seattle

Canadian Distributor: Canadian General Electric Co., Ltd., Toronto, Canada

✓ Brazing literature sent on request.

CARBOLOY

**CEMENTED  
CARBIDES**

TRADEMARK

**TOOLS • DIES • DRESSERS • MASONRY DRILLS • WEAR RESISTANT PARTS**

TRADEMARK

such operations as die-sinking, contour profiling, angular milling, jig boring, and routing on ferrous and non-ferrous metals. The table, knee, and saddle are equipped with positive locking arrangements.

The collet capacity is 1/2 inch, the longitudinal table travel 8 inches, the cross-traverse 3 3/8 inches, and the vertical travel 5 3/4 inches. The working surface of the table is 15 by 4 1/2 inches. Four spindle speeds of 200, 400, 700, and 1000 R.P.M. are available with the regular 1/3-H.P. drive. A variable-speed drive can be furnished which provides speeds ranging from 90 to 2300 R.P.M. The floor type machine occupies a space of 22 by 19 inches and weighs 500

pounds, and the bench type weighs 350 pounds.

The 7 1/2-inch swivel-base dividing head, shown in Fig. 2—another new product just placed on the market by this company—is furnished with three indexing plates, one rapid indexing plate, and a tailstock. It provides an adjustment of 360 degrees in the horizontal plane by 1-degree graduations. The spindle nose is threaded, and will accommodate a No. 9 B & S taper. The indexing is accomplished by means of a worm and worm-gear with a 40 to 1 ratio. Index-plates provide divisions of from 1 to 50, and even divisions from 50 to 100, plus 55, 65, 75, 85, and 95. .... 54

### Van Norman Induction Heating Units for Surface Hardening

The Van Norman Machine Tool Co., Springfield, Mass., has developed a new induction heating unit for surface hardening, brazing, soldering, and other heating applications requiring localized heat. This new unit is available in two sizes, 16 and 32 kilowatts. Each machine consists of a completely enclosed unit, which can be readily adapted for hardening and heating many parts manufactured in small lots, or can be incorporated in any regular production line.

The units are designed for easy operation. The operator merely connects the proper heating coil for a particular job and sets the unit for the required heating and quenching cycle. Each piece will then be uniformly hardened, brazed,

or soldered in a few seconds. To change from one job to another, the operator simply changes the work-holding fixture and heating coil, and resets the heating cycle control. Since the entire heating operation is automatic, the chance of human error is eliminated. .... 55

### "Bench Kop" Dust Collector for Grinding and Sanding Operations

A self-contained, table type, dust collector for collecting and storing the dust from one or more flexible-shaft grinding, buffing, or small band-sanding machines is a new product of the Agat-Detroit Co., Book Bldg., Detroit, Mich. This new unit, known as "Bench-Kop," employs a standard motor-driven dust collector, mounted as an integral part of the table and connected to a down-draft funnel. It requires no connection to a centralized system or secondary dust collector, and is furnished completely assembled, ready for operation. In most cases, the collector consists of a wooden table with a wooden grille top under which is installed a sheet-metal funnel connected to the intake of a dust collector having a capacity of 600 cubic feet per minute. This equipment is also adapted for use in metal-spraying operations. The dust-laden air is blown through grids and baffles before final cleaning in the spun glass of the drum type filter. .... 56



Van Norman Induction Heating Unit



Vertical Milling Machine Brought out by Industrial Tool & Die Works

### Vertical Milling Machine and Jig Borer

The Industrial Tool & Die Works, Inc., Minneapolis, Minn., are introducing on the market a new combination vertical miller and jig borer known as the No. 0-9. This machine is of the fixed-bed construction, designed for convenient working height and ample foot room.

The 1/2-H.P. constant-speed motor that drives the spindle, and the spindle head, can be swiveled through 180 degrees. Six spindle speeds ranging from 300 to 3800 R.P.M. meet the requirements for milling a wide variety of materials, from tough steel to aluminum. The cutter-spindle has a No. 7 B & S taper hole. Four table feeds ranging from 1/4 inch to 1 1/8 inches per minute are available in both directions, changes in feed being obtained by simply turning a hand-wheel. There is a fast hand feed and a worm feed to the spindle. A simple independent directional lever for starting, stopping, and reversing the table simplifies operation. All drives are equipped with anti-friction bearings, and all rotating parts are enclosed. High-pressure lubrication is employed to prolong bearing life.

# IT ROTATES

**IT CAN BE BALANCED!**

**GISHOLT DYNETRICS NOW PROVIDE  
A COMPLETE RANGE OF SIZES FOR  
BALANCING ANY PART FROM 1 OZ.  
TO 50 TONS**



## **THE TYPE S DYNETRIC**

the smallest of the entire line, has now been perfected to the point where it performs balancing operations on parts as small as 1 ounce in weight.

## **THE NEW FLOOR TYPE DYNETRIC**

largest of its kind, is shown here balancing a huge marine reduction gear. This massive herringbone has a 16' 8" diameter, face width of 7' 4", and total weight of 100,000 pounds.

The new Floor Type Dynetric is built to accommodate parts up to 240 inches in length or requiring a swing of 200". Typical of Gisholt research and development, it is a noteworthy contribution to America's war production effort.

The Gisholt principle of Dynetric Balancing is the proved and practical means of reducing vibration and excessive wear to insure more efficient performance and longer life.

These newest developments extend its advantages in both directions—down to parts as small as 1 oz. in weight and upward to those weighing as much as 50 tons. Whatever your problem in correcting for true static and dynamic balance, Gisholt Dynetrics answer it. Full information on request.

**GISHOLT MACHINE COMPANY, 1209 E. Washington Ave., Madison, Wis.**

**LOOK AHEAD • KEEP AHEAD • WITH GISHOLT IMPROVEMENTS**

**TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES**



Adjustable stops and micrometer adjustments are provided for all hand-feed movements of the quill and vertical-spindle head slide to insure rapid and accurate positioning of the cutter. Power feed to the table is through a 1/4-H.P. motor, controlled by a single lever. A built-in cutter coolant pump can be supplied as extra equipment. The working surface of the table is 24 by 6 inches, and it has three

7/16-inch T-slots spaced 1 5/8 inches apart. The table has a longitudinal power movement of 12 inches, and a crosswise travel by hand of 6 inches. The head has a vertical travel of 3 inches. The maximum distance from the spindle nose to the top of the table is 8 inches. The machine requires a floor space of 38 by 34 inches, and its weight is approximately 850 pounds. 57

### Fellows Cone-Point and Circular-Pitch Gear-Testing Fixtures

The Fellows Gear Shaper Co., Springfield, Vt., has recently placed on the market two new devices for checking gears. One of the fixtures, known as a cone-point testing fixture (Fig. 1), is used for checking concentricity of the pitch circle; the other fixture is used for checking the circular pitch or tooth-to-tooth spacing. Both fixtures have a maximum capacity for handling gears up to 12 inches pitch diameter, the maximum distance between centers being 15 inches.

These fixtures comprise a base on which three adjustable brackets are mounted. Two of the brackets carry the work-holding centers; and the third bracket, which is located at right angles to those carrying the centers, holds the measuring pointers, fingers, and dial indicator, as well as the indexing mechanism.

The headstock and tailstock brackets are provided with clamping levers. The spindles that carry the centers are adjusted through a

rack and pinion, and are clamped by levers. The bracket carrying the measuring pointers can be located in either of two positions. This feature, together with the adjustable spindle, facilitates the handling of any gear within the capacity of the fixture. A work-indexing device connected to the lever that operates the pointer-holder automatically indexes the work on the return stroke. The indexing fingers are adjustable for different pitches and numbers of teeth.

In the circular-pitch testing fixture, shown in Fig. 2, the spindle that carries the locating and measuring fingers is provided with a graduated collar at the rear end, so that the fingers can be set in a position normal to the helix angle when checking helical gears. The measuring brackets for cone-point and circular-pitch testing are interchangeable on the same base. These fixtures are intended for use on a bench. 58

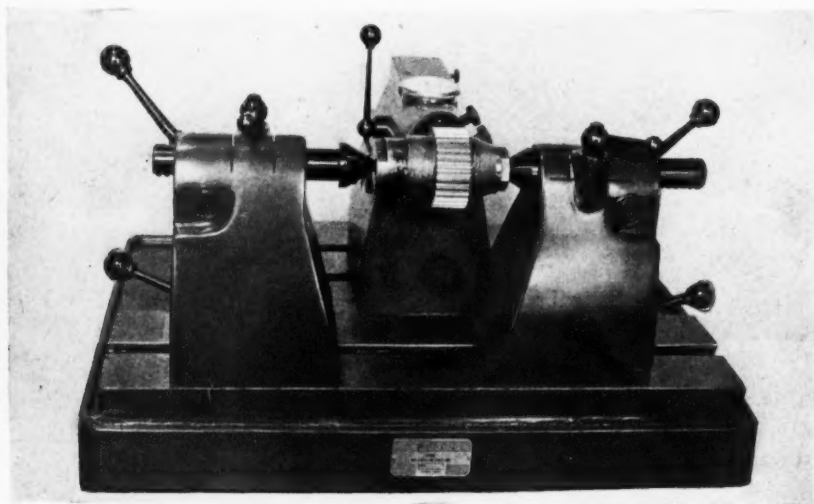
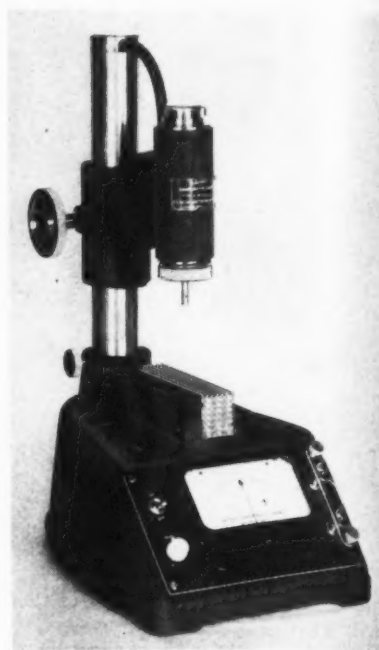


Fig. 1. Fellows Cone-point Testing Fixture for Checking Concentricity of External Spur and Helical Gears



Four-range Comparator Gage Made by Metron Instrument Co.

### Metron Four-Range Electric Comparator Gage

An electric comparator gage of the four-range precision measuring instrument type, designed for the rapid comparison of close-tolerance machine parts, selective sorting of machine parts, measuring taper and out-of-roundness, and measuring shop tools and gages to determine accuracy and wear, has been brought out by the Metron Instrument Co., 432 Lincoln St., Denver, Colo. This gage is designed to entirely eliminate the human element of "feel" usually associated

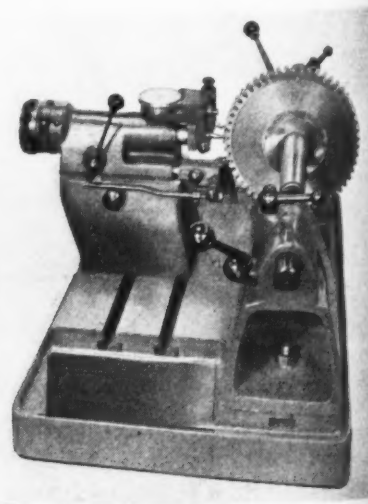


Fig. 2. Fixture for Checking Circular Pitch or Tooth-to-tooth Spacing

# GOOD OPERATORS *never use dull tools!*



## KEEP ALL CUTTING TOOLS SHARP!

Dull tools result in poor finish and rejected work.  
They waste power and vitally needed tool steel.



Reprints of this page are available for bulletin board use in your turret lathe department.  
Write the Gisholt Machine Company, 1209 East Washington Avenue, Madison, Wisconsin.  
Ask for "War-Time Care and Operations poster No. 3." State quantity required.

with close-tolerance inspection. It can be set to size in less than twenty seconds, using a master part or gage-block. When the part to be compared with this master is placed on the anvil under the spindle, any deviation in size or dimension is immediately indicated by the instrument.

Four ranges of sensitivity are available—namely, plus or minus 0.0002, 0.0004, 0.002, and 0.004 inch. The range of measurement actually marked on the scale is

from 0.00001 to 0.004 inch. The four ranges provide magnifications of 10,000, 5000, 1000, and 500. Special scales with higher magnifications and wider ranges can be provided if desired, and metric scales can be furnished. The spindle pressure is variable from 2 ounces to 2 pounds by simply rotating a knob, the pressure remaining constant for any adjustment. The gage head can be swiveled around the column and tilted at any angle. .... 59

### Atlas Screw Machine Attachments for Lathe

Attachments are now available for converting the F series 10-inch lathe made by the Atlas Press Co., Department 7, Kalamazoo, Mich., into a hand type screw machine for the rapid production of small precision parts. The most recent production set-up of this lathe, as shown in the accompanying illustration, includes lever type collet chuck, carriage turret with four-way toolpost and back-slide toolpost, tailstock turret for six operations, multi-stop attachment for gaging lengths of cuts, reversing switch, and spindle nose cap. The lathe is also equipped with a reversible power cross-feed and longitudinal feed, complete V-belt drive, and tapered roller spindle bearings.

The collet has a capacity of 1/2 inch; the swing over the bed is 10 1/4 inches; and there are sixteen spindle speeds ranging from 28 to 2072 R.P.M. The thread-cutting range for both right- and left-hand threads includes any number of threads from 4 to 96. Four bed lengths are available with capacities ranging from 18 to 36

inches between centers. The carriage turret posts take 3/8-inch cutter bits, and the tailstock turret head has six 3/4-inch bored holes for tool-holders. .... 60

### Machine for Printing Identifying Colored Bands on Cylindrical Work

A machine for printing identifying colored bands, insignia, and other important data on small cylindrical parts has just been placed on the market by Jas. H. Matthews & Co., 3942 Forbes St., Pittsburgh, Pa. This machine has an input gravity feed chute in which the parts to be marked are deposited by hand. From the chute, the parts roll to the printing unit.

Printing in one or more colors is accomplished by interchangeable synthetic rubber type, held in the printing plate cylinder. Liquid inks, with either dye or pigment colors, are used. These inks dry quickly, permitting the marked

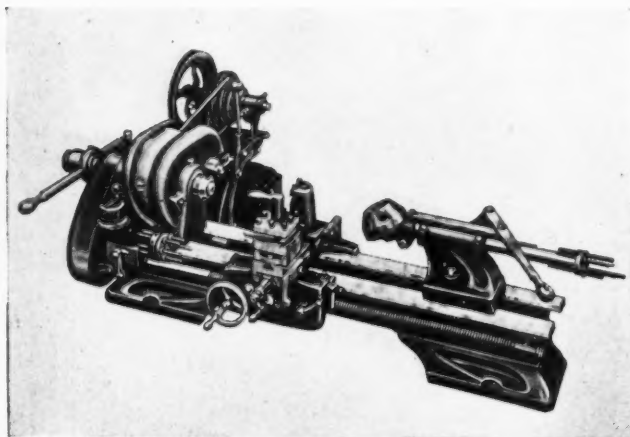


Matthews Marking Machine for Cylindrical Pieces

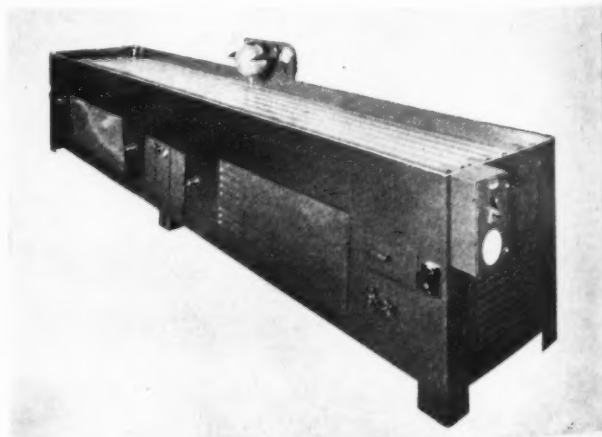
parts to be handled within thirty minutes after the printing operation. The marked pieces roll from the printer onto the receiving table or conveyor. The machine occupies a floor space of 18 by 30 inches, and weighs about 600 pounds. .... 61

### Hydraulic Test Bench for Aircraft Tubing

A hydraulic test bench—the T-102—which is designed primarily for checking aircraft tubing has just been brought out by Hydraulic



Atlas Lathe with Screw Machine Attachments for Producing Small Precision Parts



Hydraulic Testing Bench Designed for Checking Aircraft Tubing

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Photo by  
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**GREAT GUNS**  
**GET A BETTER FINISH!**

## SUNOCO EMULSIFYING CUTTING OIL

*improves finish . . . cuts cost . . . on grinding operation at gun plant*

With so much depending on them, American guns have to be good. They are! On the far flung battle-fronts of the world, rifles and tommy guns, howitzers and 16 inchers produced in American factories are proving to be without equal.

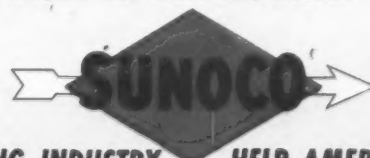
One contributing factor in making possible the nth degree precision of these guns is Sunoco Emulsifying Cutting Oil. For example, one large plant was having trouble with the finish of its gun parts. At the suggestion of a Sun Oil Engineer—one of those well-known Doctors of Industry—a change was made in the coolant on the grinding operation. One part of Sunoco Emulsifying Cutting Oil was mixed with 45 parts of water and

tried on one machine. Improvement in finish was so marked it could be seen with the naked eye. Immediately Sunoco was adopted for all machines using a soluble cutting oil . . . and besides getting better finish, the company saved nearly 50% in cutting oil cost!

That's typical of how Sun Oil Engineers and Sunoco Emulsifying Cutting Oil are helping the metal working industry in its tremendous war effort. Prove Sunoco's production-boosting merit in your own shop . . . under your own conditions. Write

**SUN OIL COMPANY • Philadelphia**  
*Sun Oil Company, Ltd., Toronto and Montreal, Canada*

**SUN PETROLEUM PRODUCTS**



**HELPING INDUSTRY**

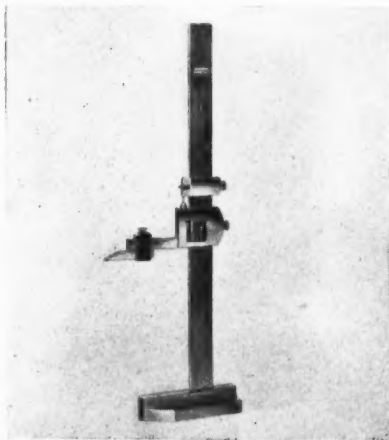
**HELP AMERICA**

Machinery, Inc., 12825 Ford Road, Dearborn, Mich. It can be used by two operators at a time, and in an emergency, a third operator can employ the accumulator hook-up. The accumulator is adapted for checking aircraft valves, and can be operated at a maximum test pressure of 100 pounds per square inch.

The operating equipment, enclosed within the bench base, consists of two variable-delivery high-pressure pumps, each driven by a 10-H.P. motor and one hydraulically driven high-pressure intensifier. All this equipment is piped with the necessary relief valves and filters. At each end of the table are six hydraulic test port openings, the pipe size being 1/2 inch. The test port openings are located 5 1/4 inches apart. Each port has a control valve of the needle point type. The complete unit is 36 inches wide, 38 inches high, and 193 inches long. 62

### Jansson Vernier Height Gage

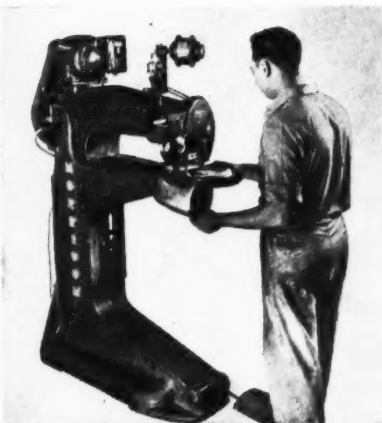
A vernier height gage made in three standard sizes of 12, 18, and 24 inches, for either English or metric measure, is a recent product of the Jansson Gage Co., 19208 Glendale Ave., Detroit, Mich. This height gage is designed especially for use in jig and fixture making and for general lay-out and inspection work. Precision calibration makes these gages valuable adjuncts to gage-blocks in angular measurement and other operations where unusual accuracy is required. 63



Vernier Height Gage Made by Jansson Gage Co.

### Morrison Aircraft Metal Stitcher

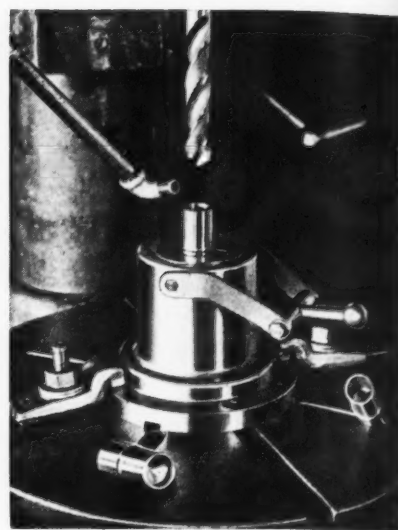
The Seybold Division, Harris-Seybold-Potter Co., Dayton, Ohio, has brought out a new Morrison wire-stitching machine designed to provide a fast versatile method of fabricating or assembling such materials as heat-treated aluminum alloys, tempered and annealed stainless steel, cold-rolled steel, cork, asbestos, rubber, wood, and canvas in any combinations and in various thicknesses up to 3/4 inch. In a single operation, the machine forms its own stitch or staple of 18-gage wire and drives and clinches it. This method of assembling saves time and labor by eliminating such operations as cleaning, prepunching, predrilling,



Morrison Wire-stitching Machine

matching, and accurate trimming, as well as repeated handling. The machine calls for no special skill, and requires but one operator.

The operator simply holds the work in position and depresses a foot-pedal, causing the stitching to be completed almost instantly. A space of 25 inches between the head and pedestal of the machine allows ample room for large sheets or assemblies. The foot control pedal can be moved to suit the operator's convenience. The stitch or staple width, as measured inside the legs, is 7/16 inch, and the minimum stitch spacing is 3/4 inch between centers. The minimum parallel stitching space is 1/8 inch between centers. The machine is driven by a 1 1/2-H.P. motor running at 1725 R.P.M. It requires a floor space of 21 by 44 inches, and the net weight of the machine is 1375 pounds. 64



Zagar Collet Chucking Fixture Used for Drilling Hollow Plug

### Zagar Collet Chucking Fixture

A universal device for indexing or holding work on machine tools has been introduced on the market by Zagar Tool, Inc., 23880 Lakeland Blvd., Cleveland, Ohio. This new collet chucking fixture is adapted for indexing work on milling machines, lathes, drill presses, grinders, and other machine tools. Two types are available, one for holding and indexing, and one for holding purposes only. Each type is made in sizes for holding round stock or round-shank tools 1 and 2 inches in diameter.

The collet type does not move vertically in closing, a feature that facilitates finishing work to close tolerances. The same handle serves for opening, closing, and indexing the fixture. A stationary handle, however, is provided to facilitate indexing the full 360 degrees. Two tapped holes are provided for attaching a bracket, locating block, drill-bushing holder, or special adapter for locating the work.

Three standard indexing plates are included for four, six, and eight divisions; others can be furnished to order within a range of two to twenty-five divisions. A hole in the lock-screw, tapped to receive a pipe, provides for feeding cutting oil to the tool under pressure. The coolant rises through the collet, lubricates the work, and cleans off any chips. A graduated scale is provided on the upper face of the body for making unusual divisions. 65



# TERROR FROM THE SKIES

On many fronts our air-borne invaders are striking terror in the hearts of our enemies. For war today is three-dimensional, and mountains, deserts, seas and fortifications offer no obstacles to U. S. Paratroops.

Transporting armies through the air is a big job—a job that calls for big planes and big engines. Today, engines of 2,000 horsepower are commonplace. Already on testing blocks, in manufacturing departments and on drawing boards, in engine plants throughout the country, is the promise of engines that will dwarf even these giants.

And transmitting the power from these engines are gears of such light weight—of such extreme precision, metallurgically and dimensionally, that engineers marvel that they could be produced by mass production methods.

How the problems that were presented in their design and manufacture were overcome is a military secret. But the mounting figures of our aircraft production is proof that here at Foote Bros. these precision gears are rolling off production lines in an amazing volume.

When the war is won, these same gears give promise of revolutionary advantages in the design of machinery—advantages that will mean "better power transmission through better gears."

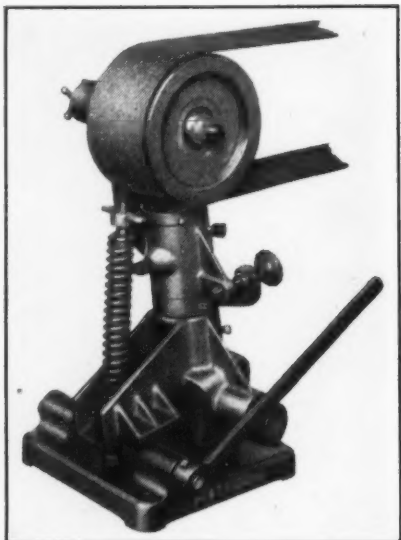
FOOTE BROS. GEAR AND MACHINE CORPORATION  
5225 South Western Boulevard  
CHICAGO

To assist Paratroops in recognizing arms, ammunition and supplies instantly, colored parachutes are used. Pictured here are men and equipment descending upon a foreign airfield.

# FOOTE BROS.

*Better Power Transmission Through Better Gears*





Mattison Abrasive Belt and Idler Pulley for Use with Lathe

### Mattison Abrasive-Belt Idler Stand and Pulley

Grinding and polishing lathes can be easily adapted to the use of factory-coated abrasive belts by adding to the No. J-135 abrasive-belt idler stand and pulley recently brought out by the Mattison Machine Works, Rockford, Ill. The stand is placed at the rear of the lathe to permit an abrasive belt to be run over a contact roll or wheel on the lathe and to travel back around the idler pulley. With this arrangement, the grinding is done on the abrasive belt instead of on a set-up wheel.

The ball-bearing idler pulley is mounted on a yoke, which can be swiveled by a handwheel to align the pulley and belt. Handwheel adjustment is provided for positioning the belt on the pulleys.

The entire assembly swings on a hinge shaft mounted on the base. Slack in the abrasive belt is automatically taken up by sensitive spring tension, the spring being adjustable to suit various types of work. Adjustment for either right- or left-hand operation is obtained by turning the column and upper assembly half way around on its base. .... 66

### Wheel for Grinding Hard Steels

A precision grinding wheel of open cellular construction, with a No. 15 abrasive content, has re-

cently been placed on the market by the American Emery Wheel Works, Providence, R. I. This wheel is especially designed for use in tool-rooms. Its open porous construction gives adequate chip clearance and space for air cooling, thus permitting the hardest alloy steels to be cut without loading or burning of the wheel. In wet grinding operations, the porosity enables the wheel to carry extra coolant, which insures cooler cutting. .... 67

### Pier Automatic Air-Operated Press Type Welders

Series P-50 and P-100 automatic air-operated press type welders have recently been added to the electric welder line of the Pier Equipment Mfg. Co., Benton Harbor, Mich. These welders are de-



"Peer" Automatic Press Type Combination Projection and Spot Welder

signed for high-speed precision projection and general spot resistance welding of sheet and structural steel assemblies, wire, and non-ferrous metals. They are equipped with double-acting air cylinder and control valves to provide for smooth, rapid action. Pressures are readily adjustable by means of a regulating valve, and range from 800 to 4000 pounds, depending on the cylinder sizes.

Die platens with T-slots hold the projection welding dies, while for spot-welding operation, each welder is supplied with two 2 1/2-inch diameter by 8-inch copper horns, machined to accommodate 1 1/4-inch water-cooled electrode-holders either at right angles, or in an offset position. Standard throat

depths are 12 and 24 inches. The Series P-50 machines, one of which is shown in the accompanying illustration, is made in two transformer capacities of 30 and 50 K.V.A., while the P-100 welders are made in 75, 100, and 150 K.V.A. capacities. .... 68

### Automatic Bucker for Aircraft Riveting

Bucking and riveting can be accomplished simultaneously with a new automatic bucker just brought out by the Aero Tool Co., Burbank, Calif. With this equipment, one woman operator can do the work that would otherwise require two operators in riveting airplane and other sheet-metal parts. Extreme light weight, ease in handling, and better and faster riveting are claimed for this equipment.

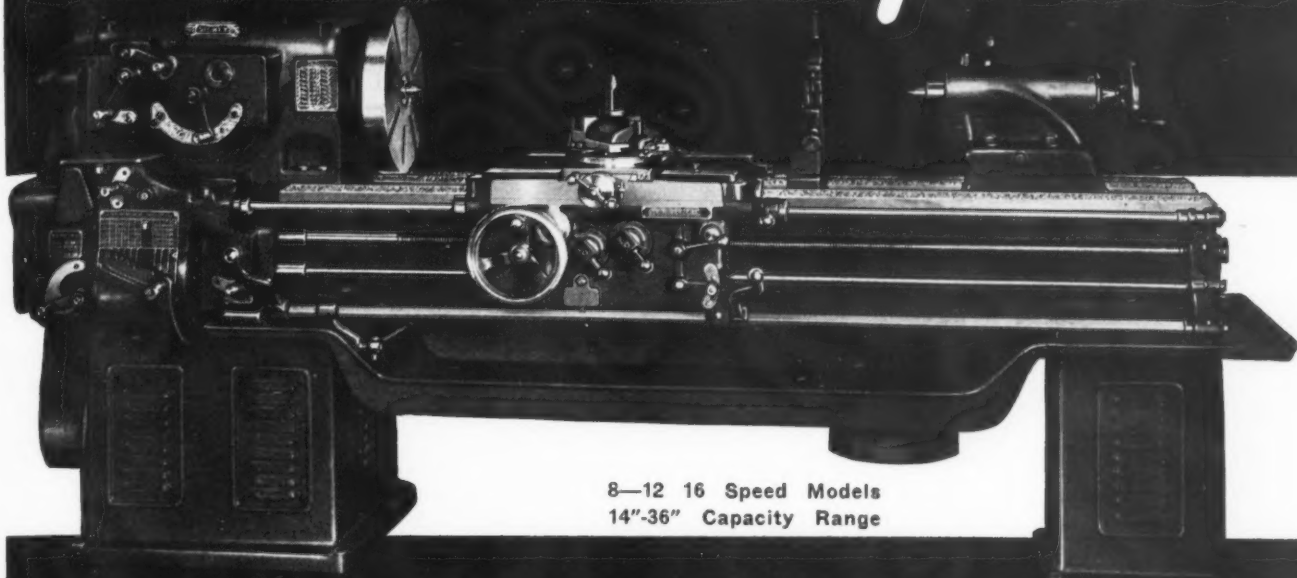
The bucker with a 22-inch throat weighs but 14 pounds, and the size with a 36-inch throat weighs 16 pounds, including the riveting gun. These buckers can be used with any standard rivet gun, and can be furnished with specially designed heads for any type of aircraft construction. The design provides for driving the rivet instantly and in perfect alignment, thus eliminating crooked or distorted rivets.

Parallel yokes provide for riveting side panels, wings, and lead-in edges. Special yokes are furnished for engine cowling and other parts requiring extra clearance. On horizontal structures, the rivets can be preloaded, while on vertical structures the rivets can be inserted in the usual manner. .... 69



Automatic Bucker for Riveting Operations Made by Aero Tool Co.

# Smooth Flowing Power



8-12 16 Speed Models  
14"-36" Capacity Range

## Sidney Lathes

• The Accuracy and smooth finish essential to high production war work is assured by the smooth drive mechanism on Sidney Lathes.

The pulley, mounted on pre-loaded anti-friction bearings, is full floating on a sleeve bolted to the headstock to eliminate deflections of the drive-shaft because of belt pull.

The clutch is built for heavy duty service, is of toggle action type with single point adjustment. Clutch is equipped with gear tooth driving plates. The friction discs, back plates and floating plates are suitably finished to insure smooth, positive operation.

Thus you get a smooth drive with resultant smooth finish on the work.

*Bulletins covering all models available  
at your request.*

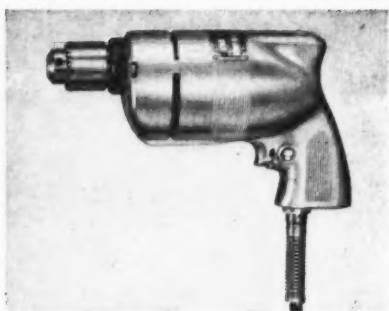


**The SIDNEY MACHINE TOOL Company**  
*Builders of Precision Machinery*

**SIDNEY**

ESTABLISHED 1904

**OHIO**



Heavy-duty Electric Drill  
Made by Skilsaw, Inc.

### Skilsaw Electric Drill

A Model 47 Skildrill, designed especially to speed up the production drilling of holes up to 1/4 inch in diameter in steel and up to 1/2 inch in diameter in wood, has just been added to the line of electric hand drills made by Skilsaw, Inc., 5039 Elston Ave., Chicago, Ill. Like the Model 45 Skildrill, the new drill is small, light, and compact; yet it has greater drilling power and greater speed under load. It weighs 3 1/2 pounds, and is 7 1/4 inches long and 2 9/16 inches wide. The universal motor is available in speeds of 1800, 2500, 3500, or 5000 R.P.M. 70

tor, operating at 1200 R.P.M. Suitable motor equipment can be supplied to meet other electric power requirements. The operating fluid is supplied either from the aircraft or tester reservoir. The testing pressures range from 500 to 3000 pounds per square inch.

The suction and pressure lines, including the valves, of the hydraulic system to be tested are disconnected from the pump and connected to the test stand. The volume of liquid pumped is adjusted to any desired amount between 0 and 3.2 gallons per minute, and the test stand relief valve is set at a higher pressure than the relief valve of the hydraulic system. The hydraulic system of the plane is then tested in the same manner as under flight conditions. 71



"Spee-Dee" Portable Printer

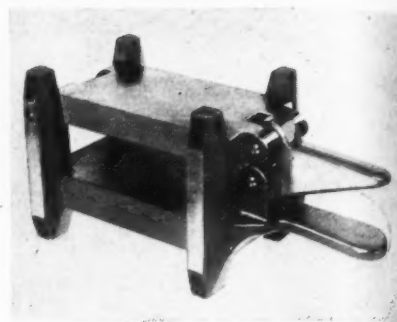
### "Spee-Dee" Printer for Blue and Black Prints

A machine for making blueprints or black and white prints, known as the "Spee Dee," has been developed by Peck & Harvey, 4325 Addison St., Chicago, Ill. With this printer, either blueprints or black and white prints can be made in half a minute, the exposure time frequently being only twenty seconds. The developing time for a black and white print by the Directo process is ten seconds.

This portable table model printer can be plugged into any standard electric outlet. It can be used to duplicate tracings, drawings, letters, or any written or printed matter. It is made in two sizes—12 by 18, and 18 by 24 inches—and is available with or without the automatic timer. 72

### Parlec Universal Drill Jig

A new type basic drill jig unit, known as the "Parlec Universal," which is designed to speed up



Universal Drill Jig Made by  
Earl C. Parkhurst

production, is being placed on the market by Earl C. Parkhurst, 751 E. Stepney Place, Inglewood, Calif. This jig is made with cover sizes ranging from 1 1/2 by 2 inches to 3 by 11 inches. The jigs are sturdily constructed of cast nickel-iron, and normalized. The top, bottom, and both sides of the jig frame and cover are finished.

With these basic units it is only necessary to finish the base for location of the part to be drilled, add side plates, if side drilling is required, and provide bushings, in order to make the jig ready for production. The special quick opening and locking device is designed to save time. 73

### Leonard Tube Flaring and Beading Machine

A bench type, motor-driven machine that squares, burrs, flares, and beads ferrous and non-ferrous tubing has been introduced on the market under the trade name "Tube Master" by the Leonard Precision Products Co., 1100 Larson Ave., Garden Grove, Calif. This machine is especially adapted for use in aircraft plants. It can be



Tube Squaring, Flaring, and  
Beading Machine

### Denison Portable Test Stand for Hydraulic Systems

A portable test stand, known as the Model HTS3EM HydrOilic, for checking the entire hydraulic system of aircraft operating on pressures up to and including 3000 pounds per square inch, is now being built by the Denison Engineering Co., 1152 Dublin Road, Columbus, Ohio. The stand is driven by a 7 1/2-H.P., three-phase, 220-volt constant-speed mo-



Denison Portable Test Stand for  
Hydraulic Systems of Aircraft



# FOR QUICK ACTION

● Our wartime strategy of making wheels only 3" in diameter and under is approved and endorsed by W P B. We make a 24-hour a day job of it. All vitally needed wheels are shipped promptly. There is no let-up. Our central location gives us a head start on deliveries.

**Custom Built Wheels**, just the right wheels for your particular job, no matter how precise or difficult it is.

The moment we have your grinding problem, it's turned over to abrasive engineers who make up the wheels that do your job better and faster.

Years of research and Specialized\* experience are behind each Chicago Grinding Wheel.

You can depend on prompt deliveries. GET IN TOUCH WITH US!

**TEST WHEEL**—Tell us the kind of job and size wheel you need. We'll be glad to send one without charge.



\*Half a century of specialization has established our reputation as the Small Wheel People of the Country.

**CHICAGO WHEEL & MFG. CO.**  
1101 W. Monroe St. Dept. MR Chicago, Ill.

Send Catalog. Interested in

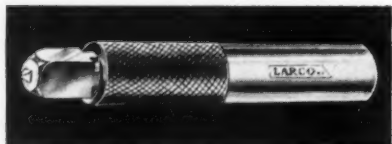
MR-4

☐ Grinding Wheels ☐ Mounted Wheels ☐ Send Test Wheel. Size \_\_\_\_\_

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

quickly prepared for any of the various operations for which it is adapted. Ten sets of flaring dies and centers and squaring and burring attachments are standard equipment for handling tubing ranging from 1/4 inch to 1 1/2 inches outside diameter. The machine can be furnished with pneumatically operated jaws and a two-speed spindle if desired. 74



Larco Diamond Dressing Tool

### Larco Diamond Dressing Tool

The Larco Tool Division of Louis A. Roselaar, 551 Fifth Ave., New York City, has placed on the market a patented diamond dressing tool embodying several advantages. The operator can reset the point of the diamond himself very quickly, so that there is no need to send the tool for resetting or to carry a reserve tool stock. The holder is provided either with one cap for a specific size diamond or with a number of caps to accommodate several sizes. 75

## Saving Work in the Drafting-Room by the Use of Rubber Stamps

The value of rubber stamps in reducing the work on drawings has recently become recognized. L. H. Remiker, chief engineer of the Lindberg Engineering Co., Chicago, Ill., points out that while, for years, rubber stamps have been used to speed up the placing of titles on drawings, it is only recently that they have been employed for placing symbols and repeated constructions on drawings.

To save time in the Lindberg company's engineering department, a few symbols were cut into rubber stamps to be used in making drawings. The results were so good that gradually the number was increased, and almost every week a new place is found for a rubber stamp. On wiring diagrams, these rubber stamps have become particularly useful. They provide a greater degree of uniformity between the different drawings and between the same symbols on the same drawing. Chances of errors are eliminated, for if the stamp is correct, there can be no error in the part that is stamped on the drawing. Wiring errors are reduced, as all numbers indicating connections, if once correct, are always correct. In one instance, a complete drawing of a wiring di-

agram for a certain type furnace would require, without rubber stamps, approximately eight hours to make. By using rubber stamps for the parts of the drawing that are frequently repeated, the time was reduced to three hours.

The highest price that has been paid by this engineering department for a rubber stamp has been \$7.50. Enough time was saved in making a single drawing to pay for this stamp. At present, when so many young draftsmen are joining the armed forces, it has been found necessary to train girls for detail drafting. The saving in time and the assurance of accuracy resulting from the use of these rubber stamps is very great.

\* \* \*

### Asbestos Fabric Fittings for Aircraft

A new line of fittings made from "Asbeston," a woven asbestos fabric, has been brought out by the United States Rubber Co. to replace critical metals in aircraft production. The fittings can be designed in any required shape and will withstand continuous heat at temperatures up to 350 degrees F.

An Unusual Method by which the Leeds & Northrup Co., Philadelphia, Pa., Brings Home to Each Worker that His or Her Efforts are Essential to the Winning of the War. Beneath a Mirror on a Poster are Printed the Words "V Depends on Me." The True Meaning of the Slogan Registers Much More Definitely when the Reader Sees His Own Image above It



# HOW TO SOLVE

Operating Problems

with *Correct Lubrication*



THIS ENLARGED AREA  
SHOWS MICROSCOPIC  
IRREGULARITIES OF  
BEARING AND JOURNAL  
SURFACES

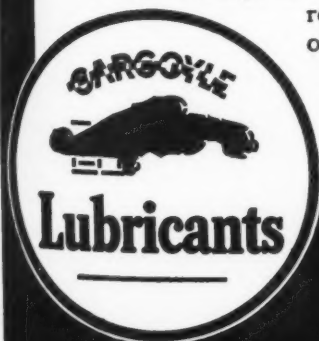
## Keep Journals "Floating"

**PROBLEM:** That's a picture of a simple bearing and journal lubricated by a circulation system. See how their surfaces, so polished to the naked eye, are actually jagged hills and valleys under the microscope! Unless a thick film of oil separates these surfaces the irregularities tend to interlock, cause friction and excessive wear. When bearings are supplied with sufficient oil, rotation of the journal forms an oil wedge thick enough to ac-

tually float the journal. When deposits in the oil passages prevent adequate oil supply, the oil wedge is destroyed and excessive wear results — and that's the problem in a nutshell.

**ANSWER:** Gargoyle Vacuoline Oils are ideal for circulation-oiled machine bearings. They resist to a maximum the most severe deposit-forming influences and assure continuous oil flow to the bearing.

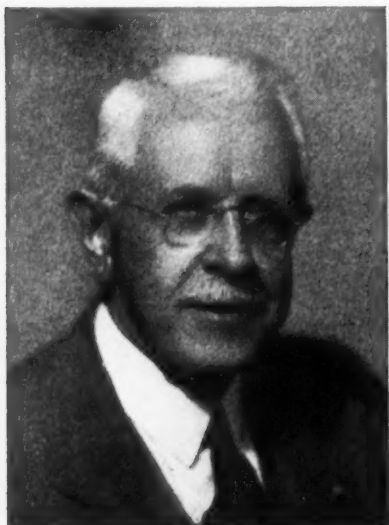
SOCONY-VACUUM OIL COMPANY, INC. — Standard Oil of N. Y. Div. • White Star Div. • Lubrite Div. • Chicago Div. • White Eagle Div. • Wadhams Div. • Southeastern Div. (Baltimore) • Magnolia Petroleum Co. • General Petroleum Corp.



**CALL IN SOCONY-VACUUM**

## Fred L. Eberhardt Celebrates Seventy-Fifth Birthday

Fred L. Eberhardt, president and general manager of Gould & Eberhardt, Inc., Irvington, N. J., celebrated his seventy-fifth birth-



Fred L. Eberhardt

day on February 27. A dinner was given in his honor by employees and friends at the Elks Club in Irvington, on which occasion he was presented with a gold watch bearing an inscription commemorating the event.

Mr. Eberhardt, who was born in Newark, started to work in his father's machine tool shop sixty-two years ago, when he was only thirteen years old. Twenty years later he became president and general manager, a position in which he has been active ever since.

Mr. Eberhardt is a recognized leader in the machine tool industry. He was president of the National Machine Tool Builders' Association from 1907 to 1909, and is still active in the Association's work. He has been a member of the American Society of Mechanical Engineers for fifty-four years, and was recently made a Fellow of that Society. For more than twenty-five years he has been an active member of the Society of Automotive Engineers.

Mr. Eberhardt has also been prominent in local civic, business, and educational activities. He is president of the board of trustees of the Newark Technical School and of the Newark College of Engineering. He was a member of

the first class to enter the Newark Technical School when it was started in 1881. He is a member of the Newark Chamber of Commerce and a director of the Fidelity Union Trust Co.

\* \* \*

## Interrupting War Production

One thing Congress can do is to make labor organizations responsible for their actions. As it is now, any labor leader can any time he wishes interrupt war production, and no matter how serious the interruption may be, there is no penalty. If tying up production on fighter planes, for example, were considered as serious as failing to declare a pound of coffee, and the same penalty—five years in prison and a \$10,000 fine—were attached, unauthorized strikes would quickly pass out of existence.—*DeWitt Emery, President, National Small Business Men's Association*

## Award for Speeding War Production

For outstanding contribution to the war production program, Jack Hennessy, of the Geo. D. Roper Corporation, Rockford, Ill., recently received the *Chicago Tribune* War Workers' Award, consisting of a gold pin studded with diamonds.

Mr. Hennessy received this award for the development of two machines used in war production. He designed and built a single-spindle drilling machine for drilling tracer holes in 75-millimeter shells. This machine replaced a vertical four-spindle drilling machine. The new machine, which is of simple design, has tripled production. Moreover, it has made it possible for an unskilled girl to perform this operation, which formerly required highly skilled men. It is also to be noted that the new machine was built at a cost of about \$300, as against \$5000, which was the cost of the four-spindle machine.

Mr. Hennessy has also developed a milling machine for milling slots in the nose of 75-millimeter shells. This machine has increased production from four to five times.



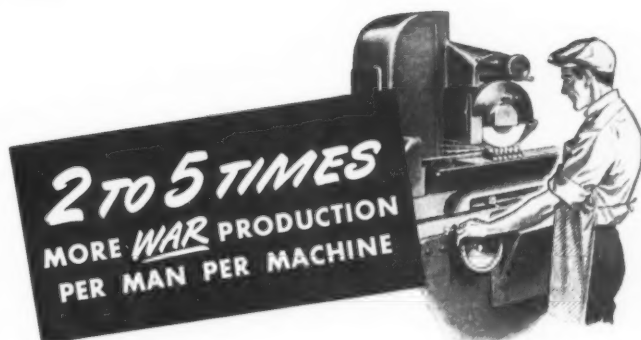
Jack Hennessy and His Single-spindle Drilling Machine that Increased Production Three Times over the Former Method

# IMPORTANT NOTICE TO WAR PLANTS CONCERNING POR-OS-WAY DELIVERIES

**WE MUST BE FRANK.** When we first announced the Por-os-way precision grinding wheel a little more than a year ago, we were ready with a plant far exceeding our previous one in size, equipment and man-power. It was, we felt, big enough to meet all demands. But two things have happened. First, the war. Then Por-os-way, making good its promise to increase grinding production 2 to 5 times per man per machine, has literally sky-rocketed in demand. Hundreds of grinder foremen and grinding machine operators want to prove Por-os-way can up production 2 to 5 times for them, want to see what makes it different from other wheels, how its cool action practically eliminates burning, how it takes cuts double or more than previous wheels and grinds in fewer passes, how it can cut faster producing an even *better finish using a finer grain*, why it resists loading, holds its corner, reduces dressings necessary.

## ORDERS INCREASED 700%

Orders have poured in. Not at a steady pace but at an ever increasing rate. Our production



is now forging ahead—yet is still not enough to satisfy the full demand for Por-os-way.

## RELIEF IS IN SIGHT

Working 'round the clock was not enough. We needed more plant, more equipment, more men. Work on expanding our facilities is now completed. Greatly increased production is now under way. Again we believe it will be amply big enough to take care of all your demands. Naturally we want every war plant to know the exceptional advantages of Por-os-way wheels. And so, we're doing all we humanly can to keep up on delivery. In the meantime, write A. P. de Sanno & Son, Inc., 428 Wheatland Street, Phoenixville, Penna. for a booklet "Facts About Por-os-way". It gives a complete story.

**POR-OS-WAY\***  
*a new*  
**RADIAC\* PRODUCT**



**A. P. DE SANNO & SON, INC.**  
NEW YORK, CHICAGO, PITTSBURGH,  
CLEVELAND, DETROIT, LOS ANGELES



**PHOENIXVILLE, PENNA.**  
Western Gateway to  
VALLEY FORGE

\*T. M. Reg. U. S. Pat. Off.  
COPYRIGHT, 1943, A. P. de Sanno & Son, Inc.

# NEWS OF THE INDUSTRY

## California

**HANDY & HARMAN**, New York City, fabricators of silver and gold alloys, announce the opening of an office at 1206 S. Maple Ave., Los Angeles, Calif. This office has been opened principally to meet the needs created by the rapid growth in the use of Sil-Fos and Easy-Flo silver brazing alloys in the construction of ships and airplanes. **H. A. FOLGNER**, who has been connected for many years with the company's Brazing Engineering Division in New York, has charge of the Los Angeles office.

## Illinois

**B. H. QUACKENBUSH** has been appointed assistant sales manager of Foote Bros. Gear & Machine Corporation, Chicago, Ill. Mr. Quackenbush is



**B. H. Quackenbush**, Assistant Sales Manager of Foote Bros. Gear & Machine Corporation

a graduate of the Mechanical Engineering College of the University of Illinois. He became connected with the Foote Bros. organization in 1933, and in 1936 was placed in charge of the Contract Division.

**WHITING CORPORATION**, Harvey, Ill., announces that the headquarters of its Canadian subsidiary, **WHITING CORPORATION (CANADA) LTD.**, have been moved to 45 Richmond St., West, Toronto. **H. M. ROWLETTE**, newly elected vice-president and general manager, will

be in active charge of the Canadian business. He succeeds **COLONEL JAMES MESS**, who is now devoting his full time to government duties at Ottawa.

**FRED E. GARNER CO.** has opened its plant No. 2 at 1100 W. Washington St., Chicago, Ill. The new plant will manufacture frequency meters, test equipment, radio telephones, silent and sound picture projectors, and other devices. The general offices will remain at 43 E. Ohio St., Chicago.

**UNITED PRECISION PRODUCTS CO.**, manufacturer of precision gages, announces its removal to larger quarters at 3524 W. Belmont Ave., Chicago, Ill. The rapid expansion of the company's business has made it necessary to obtain larger quarters three times in the last five years.

## Michigan

**UNIVERSAL ENGINEERING CO.**, Frankenth, Mich., announces that its employees have recently contributed \$50,000 out of their own pockets to pay for a fully equipped fighter plane for America's armed forces. It is believed that this is the first case in this country in which a company of less than 1000 employees has cooperated in making cash donations to pay for this type of fighting equipment. Most of the contributions were \$50. This patriotic effort is in addition to the war bond purchases of the company, which now amount to 20 per cent or more of the earnings of each employee.

**ARTHUR W. F. GREEN** has been appointed materials engineer administrator over the heat-treating and plating divisions of the **N. A. Woodworth Co.**, Ferndale, Mich. He was formerly materials engineer for the Pratt & Whitney Aircraft Division of the United Aircraft Corporation in East Hartford, Conn. Mr. Green is a member of the Technical Advisory Committee of the War Production Board on aeronautical materials, and a member of the recently formed committee of the American Iron and Steel Institute on additions of various deoxidizing agents to steel.

**OTTO W. WINTER** has resigned the position of vice-president in charge of manufacturing of the Republic Drill & Tool Co., Chicago, Ill., to become president and works manager of Sav-Way Industries, 4875 E. Eight-Mile Road, Detroit, Mich., manufacturers of



**Otto W. Winter**, Newly Appointed President and Works Manager of Sav-Way Industries

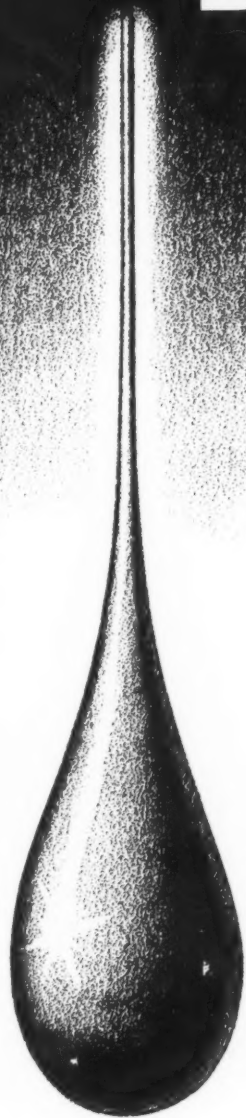
internal grinding machines, spindles, gages, precision aircraft and tank parts, end-mills, and special tool items. Prior to his Chicago connection, Mr. Winter was factory manager of Columbus McKinnon Chain-Chisholm Moore Hoist Corporation, Tonawanda, N. Y. He also spent some time in Russia as consultant engineer to the Soviet Machine Tool Trust and Cutting Tool Trust. Mr. Winter is national president of the American Society of Tool Engineers and national chairman of the Society's Committee on Education and Emergency Training. He is a member of the American Society of Mechanical Engineers, American Society for Metals, American Society of Welding Engineers, and the Society of American Military Engineers.

**WELLING F. THATCHER** has joined the Cross Gear & Machine Co., Detroit, Mich., as management executive, and will assist the president of the company, Milton O. Cross, Jr. Mr. Thatcher was until recently president of an important steel organization in Brazil, and has held executive positions with the Chrysler Export Corporation; Ser-vel, Inc.; and Union Carbide and Carbon Corporation.

**PLAN-O-MILL CORPORATION**, formerly located at Royal Oak, Mich., has moved to 1511 E. Eight-Mile Road, Hazel Park, Mich., just outside of Detroit. The corporation, in addition to manufacturing thread and form milling machines, is now producing a line of cutters.

**INDUSTRIAL SHEET METAL WORKS**, 628 E. Forest Ave., Detroit, Mich., announces that the name of the organization has been changed to **INDUSTRIAL EQUIPMENT CORPORATION**. The company

# YOUR MACHINES HAVE ONLY JUST BEGUN TO FIGHT!



## **FORTIFY** their hydraulic mechanisms with **HYDRO-DRIVE** **HYDRAULIC OILS**

Those hydraulically operated machines of yours are veterans of the industrial battle front now. They've been working without rest, 24 hours a day, and as they age so rapidly, they need great care and the best of oil.

Give them a hydraulic oil that's scientifically fortified three ways—for film strength, for oxidation stability and for gum solvency...an oil that lasts longer, serves better, lengthens the period between oil changes. Give them HYDRO-DRIVE Hydraulic Oil and watch it out-perform ordinary untreated oils used as the hydraulic medium. Write for illustrated booklet.

**E. F. HOUGHTON & CO.**

303 W. LEHIGH AVE., PHILADELPHIA

Chicago • Detroit • San Francisco • Toronto

continues to operate under the same management and at the same address.

**GARFIELD TOOL & DIE Co.**, manufacturer of dies, jigs, fixtures, and gages, announces the removal of the company from 4510 St. Aubin Ave., Detroit, Mich., to 2420 Brooklyn Ave., Detroit.

## New England

**L. G. BEAN** has been appointed vice-president in charge of engineering and sales of the **Bristol Co.**, Waterbury, Conn., manufacturer of automatic control and recording instruments. Mr. Bean was previously vice-president and general sales manager. **HARRY E. BEANE** has been made sales manager of the company. He was formerly field sales manager, supervising the activities of the company's factories at

Co., New Haven, Conn., to assist **JAMES W. SNEYD**, the company's executive vice-president. Mr. Redway was formerly vice-president of the **Farrel-Birmingham Co., Inc.**, Ansonia, Conn. He joined that organization in 1925, and since then has held various positions of increasing responsibility in the sales, engineering, and manufacturing departments. In 1938, he was elected vice-president and manager of manufacturing in general charge of production and personnel in the Ansonia and Derby plants. He has also been responsible for coordinating and planning production of the company's plant in Buffalo, as well as for sub-contracting war orders to a number of other companies. He has given considerable attention to industrial relations, and has devoted much time to the Farrel-Birmingham employe and apprentice training programs. Upon

on the production front. This means that the corporation will be entitled to add a white star to the Army-Navy Production Award flag presented to the company more than six months ago.

**J. P. ENRIGHT** has been appointed abrasive engineer for Indianapolis and vicinity by the **Norton Co.**, Worcester, Mass. **ROBERT W. CRAWFORD** has been made abrasive engineer for the company in the Pittsburgh territory, succeeding **WILLIAM A. RUSSELL**, who is now an ensign in the U. S. Navy.

## New York and New Jersey

**HOWARD M. GIVENS, JR.**, manager of tool steel sales for the **Allegheny Ludlum Steel Corporation**, Brackenridge, Pa., transferred his headquarters from Pittsburgh to the Dunkirk, N. Y.,



**L. G. Bean**, Vice-president in Charge of Engineering and Sales of Bristol Co.



**Harry E. Beane**, Newly Appointed Sales Manager of the Bristol Co.



**E. L. Stilson**, Now Serving as Assistant Sales Manager of the Bristol Co.

Chicago, Akron, and San Francisco and of the district managers, sales engineers, and service engineers. **E. L. STILSON** becomes assistant sales manager. Since 1940, Mr. Stilson has been associated with the field engineering department. Prior to that, he had served as manager of the **Bristol Co. of Canada Ltd.**, in Toronto, and, subsequently, as special sales engineer for the petroleum industry.

**A. DALE MITCHELL**, formerly associated with Barrow, Wade, Guthrie & Co., public accountants and auditors, has been named controller of the **Waterbury Farrel Foundry & Machine Co.**, Waterbury, Conn. Mr. Mitchell succeeds **WILLIAM M. BIRS**.

**ALBERT S. REDWAY** has been elected vice-president of the **Geometric Tool**

his resignation from the **Farrel-Birmingham Co.**, Mr. Redway was tendered a testimonial dinner and presented with a desk fountain pen set by the employes.

**EARL L. YOUNG**, vice-president in charge of production of the **Laminated Shim Co., Inc.**, Glenbrook, Conn., has resigned, after being connected with the company for twenty-two years.

**BULLARD Co.**, Bridgeport, Conn., manufacturer of machine tools, has again won the Army-Navy Production Award and the right to add a star to its "E" flag.

**GREENFIELD TAP & DIE CORPORATION**, Greenfield, Mass., has been awarded for the second time the Army-Navy Production Award for meritorious services

offices of the corporation on March 1. The shift is intended to centralize both the sales and manufacturing supervision of tool steels at the Dunkirk plant.

**ORVILLE T. BARNETT**, engineer of tests for Murex arc-welding electrodes, of the **Metal & Thermit Corporation**, New York City, has been made production engineer for both the arc-welding and the thermit-welding divisions. He was formerly in charge of welding and shop inspection with **Black, Seville & Bryson**, of Oklahoma City.

**SIMMONS MACHINE TOOL CORPORATION**, Albany, N. Y., announces that, for the second time in six months, a service star has been added to the Army-Navy "E" flag awarded to the firm last August. Service stars are

# Why Does a Cutting Fluid Work?

A statement of tremendous importance  
to all interested in metal machining



TO DEVELOP NEW and greatly improved types of cutting fluids—made possible by increased knowledge of the chemical and physical functions of such materials—has been the aim of Quaker Chemical Products Corporation ever since we were convinced that the current knowledge of such products was, and still is, in its infancy.

Much has been written about fatty oils, sulphurized fatty oils, sulphurized mineral oils, chlorinated fatty oils and mixtures of all of these. But a close study shows many inconsistencies and a lack of definite *knowledge*. A great many statements made were based upon *theory* . . . or intelligent guesses.

So, some years ago we set aside a portion of our research laboratory, picked three outstanding men from our own research staff and assigned to them the task of replacing these theories and guesses with definite scientific knowledge.

Obviously, if we could find out just exactly what is needed to lubricate and cool a cutting tool and could measure this in the laboratory, the entire field would progress by leaps and bounds. Naturally, we have not yet learned all the answers . . . nor can we yet effectively measure in the laboratory just what a cutting fluid will do in practice . . . but we *have* taken many long steps toward our ultimate goal.

## Sulphurized . . . But How?

When harder steels, tougher cuts and higher speeds made it necessary to improve the quality of mineral lard oil, the addition of sulphur constituted the first real advance. A little later sulphur was cooked into a combination of mineral, animal and vegetable oils. These sulphurized fatty-mineral oil combinations turned out cooler and better work than mineral lard oils or plain sulphurized mineral oil.

But our laboratory studies opened up another important angle. It soon became evident that it wasn't only the *amount* of sulphur or the *kind* of fat sulphurized that determined results. The sulphur must be combined in just the right way, so that it will be *released gradually* . . . only to the extent required to prevent metal-to-metal contact . . . otherwise the sulphur content of the oil is rapidly exhausted and tool life is materially shortened.

Thus, it is not sufficient to distinguish between "free", "combined" and "active" sulphur in cutting oils. The *rate of release* of the combined sulphur is of principal importance and can be determined only by practical machining tests . . . and not by any of the laboratory methods, such as the copper test, now in vogue.

## New Process of Polymerization Found Effective

Further research in methods of combining sulphur

led us into the treatment of fats and fatty waxes not heretofore used in cutting fluids. These were treated differently—by *polymerization* or a building up of the molecules. Next we found that *high pressure* and the use of a *catalyst* gave even better results. Finally our laboratory succeeded in producing a sulphurized, polymerized fatty wax which not only permits the sulphur to be released over an extended period of time but which also possesses extreme pressure properties as well as excellent lubricating, cooling and anti-weld qualities.

## What This New Type Product Does

Primarily, this new material is a "base". That is, it is a concentrated product that must be blended with a vehicle such as ordinary mineral oil. When diluted in this manner, this advanced type of cutting fluid replaces present types of ordinary sulphurized cutting oils.

Numerous reports in our files attest to the considerably increased production being achieved in many plants with this new product which makes possible greater speeds and feeds . . . with longer runs between tool changes. On a difficult cutting operation where tools are being changed once or even twice during an eight-hour shift, it is quite common for a Quaker Process Engineer to put this new product on the job and entirely *eliminate* these tool changes *during* shifts . . . enabling them to be made *between* shifts only. This often means a saving of almost an hour per machine per shift. Think what this can mean both in the saving of hard-to-get tools and also in terms of increased production of parts for the planes, guns and tanks needed to speed the day of Victory!

## Production Data Available

Authentic plant production data sheets containing complete figures on various machining operations with this new cutting base are available on request. They are actual reports from Quaker Process Engineers in the field and contain no advertising or "sales talk".

If you care to know more about how this new product can be of value to you, we suggest that you have a talk with a Quaker Process Engineer. These men speak your language and know how to translate our new developments into increased production in your plant. Please don't confuse them with ordinary salesmen—for before they came with us these men "cut their eye teeth" as factory chemists, metallurgists, methods engineers, or superintendents of industries such as yours. They are familiar with production problems—they deal with known facts—and they speak with authority. If you'd like to talk shop with such a man, write or wire us today.



**QUAKER CHEMICAL PRODUCTS CORP.**

**CONSHOHOCKEN, PA.**

**OTHER PLANTS: CHICAGO AND DETROIT—WAREHOUSE STOCKS IN PRINCIPAL INDUSTRIAL CENTERS**

added to the flag at the end of each six months' period for continued high production.

**R. L. CRANE MACHINERY Co.** announces that the company is now located at 296 Delaware Ave., Buffalo, N. Y.

**UNIVERSAL PRECISION PARTS Co.** announces its removal from 16 E. 18th St., New York City, to 203 E. 18th St.

**JOHN EDWARD MUCHA**, of Garfield, N. J., has the distinction of being the one thousandth employe of the Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J., to enter the armed forces. He was employed in the wrapped tubing department at the Manhattan plant. The proportion of employes in the armed forces (1000 out of 3900) is believed to be a record for the industrial plants in the Passaic area.

**ELASTIC STOP NUT CORPORATION OF AMERICA**, Union, N. J., announces that the locking device manufactured by the organization will, in the future, be known as the "Esna" nut. This trade name has been adopted as a result of the growing practice of engineers using the stop-nut of referring to it by the initials of the company.

## Ohio

**SHEFFIELD CORPORATION**, of Dayton, Ohio, and the **WICKMAN CORPORATION**, who have been operating jointly under an exclusive manufacturing and selling agreement involving certain machine tools, through which the Sheffield Corporation designed and manufactured these machine tools for the American market, announce that this agreement is being discontinued by mutual consent upon completion of the orders received under this agreement.

**LELAND M. HOGAN** has been appointed eastern district manager of the **American Welding & Mfg. Co.**, Warren, Ohio, with headquarters in New York City; **F. L. SCHNEIDER** will act as Chicago district manager; **CARL I. LARAWAY** has been made comptroller of operations; and **FRANK J. SHANABERG** becomes manager of the product development department.

**S. B. TAYLOR**, works manager of the **Reliance Electric & Engineering Co.**,

Bronze Statuette Presented by John S. Chafee, Recent President of the National Machine Tool Builders' Association to Two Machine Tool Companies for the Greatest Fourth-quarter Increase in Dollar Value of Shipments and in Number of Machines Shipped, Respectively

**Cleveland, Ohio**, since 1931, was elected manufacturing vice-president at a recent meeting of the board of directors. The following officers were re-elected: President, **CLARENCE L. COLLENS**; vice-president and treasurer, **P. MORLEY HITCHCOCK**; engineering vice-president, **A. M. MACCUTCHEON**; sales vice-president, **JAMES W. COREY**.

**F. D. JONES** has been appointed assistant advertising manager of the **Warren, Ohio**, Division of the **Copperweld Steel Co.** He was formerly advertising manager of the **Dresser Mfg. Co.**, Bradford, Pa., and prior to that was associated with the advertising department of the **Republic Steel Corporation**, Cleveland, Ohio.

**SHEFFIELD CORPORATION**, of Dayton, Ohio, and the **DEFIANCE MACHINE WORKS**, of Defiance, Ohio, have been awarded the National Machine Tool Builders' Association's president's Trophy for the greatest fourth-quarter increase in the dollar value of shipments of machine tools and in the number of machine tools shipped, respectively. The Sheffield Corporation showed in the fourth quarter of 1942 a 224 per cent increase in dollar value of shipments over the corresponding figure for the third quarter. The Defiance Machine Works showed an increase of 100 per cent in the number of machine tools shipped during the fourth quarter, compared with its third-quarter record. The trophy was offered by **JOHN S. CHAFEE** at the annual meeting of the Association last fall. At that time Mr. Chafee was president of the Association and vice-president of the **Brown & Sharpe Mfg.**



**Co.** He is now deputy director of the Tools Division of the War Production Board. The trophy consists of a bronze statuette by **Max Kalish**, entitled "The Spirit of American Labor."

**GENE P. ROBERS** has been appointed advertising manager of the **Weatherhead Co.**, Cleveland, Ohio, succeeding **ROBERT H. WEATHERHEAD**, who has resigned to join the armed services.

## Pennsylvania and West Virginia

**WILLIAM J. McILVANE** has been appointed vice-president in charge of sales and assistant to the president of



**William J. McIlvane**, Vice-president in Charge of Sales and Assistant to President of the **Copperweld Steel Co.**

the **Copperweld Steel Co.**, Glassport, Pa. Mr. McIlvane was formerly general manager of sales for the company.

**NORMAN C. EINWECHTER**, who has been a special representative for the **Carpenter Steel Co.**, Reading, Pa., has been appointed assistant to the vice-president. Mr. Einwechter's offices will be in New York and Philadelphia.

**HARRY R. MEYER** has been made general manager of sales of the **By-Products Steel Corporation**, Coatesville, Pa., a subsidiary of the **Lukens Steel Co.** He was formerly manager of direct sales for the parent company.

**INTERNATIONAL NICKEL Co.'s** **Huntington, W. Va.**, Works have received their fourth production award from the U. S. Navy. The award gives the plant the right to fly the Army-Navy "E" with three stars. Each star represents the renewal of this production honor for a six months' period.

# NEW REEVES *Reducer-Type* TRANSMISSION

**SPEED ADJUSTABILITY  
AND REDUCTION WITHOUT  
USE OF OTHER AUXILIARY  
EQUIPMENT**



## Combines Variable Speed Transmission and Gear Reducer in Single, Compact Unit . . .

● The REEVES Variable Speed Transmission, with built-in speed reducer, meets the many important requirements for accurate variable speed control and speed reduction combined in one compact, completely enclosed unit.

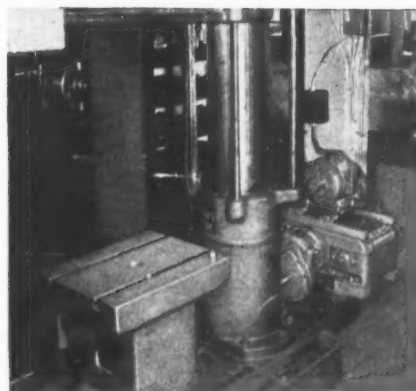
An outstanding advantage of this highly efficient drive is that far less mounting space is needed to obtain the lower output speeds which formerly required use of auxiliary speed reducing equipment.

Available in two enclosed designs—horizontal and vertical—for mounting in any convenient position. Each design is available in wide range of speeds and in capacities from 1 to 7½

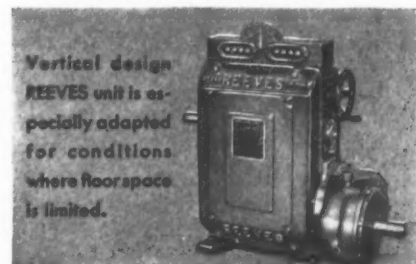
horsepower inclusive. The Transmission in various sizes provides ratios of speed variation from 2:1 through 12:1, and the reduction gears provide ratios up to and including 6.9:1.

Either horizontal or vertical design may be equipped for individual motor drive by use of a REEVES motor base. Motor mounting is directly above Transmission, the motor base being attached to top of Transmission frame. This base is universally adjustable to accommodate any standard make of motor of correct horsepower capacities for any given size of REEVES Reducer-Type Transmission. Send for copy of Catalog M-432, giving complete engineering information.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA



Horizontal design unit, with motor, direct connected to radial drill press



Vertical design REEVES unit is especially adapted for conditions where floorspace is limited.

# REEVES

*Accurate  
Variable*

# Speed Control

## Wisconsin

J. RUSSELL DUNCAN, secretary of the Peerless Machine Co., Racine, Wis.,



**J. Russell Duncan, Newly Appointed General Manager of the Peerless Machine Co.**

has been appointed general manager of the company.

JOSEPH J. JILBERT, for twenty years superintendent of the Mattison Machine Works, Rockford, Ill., and for the last four years machine shop superintendent of Ampco Metal, Inc., Milwaukee, Wis., is now connected with the Stokerunit Corporation of Milwaukee, manufacturer of precision boring machines, milling machines, and special machinery.

CLIFF SCHWENN has been appointed general superintendent of the foundry of the Brillion Iron Works, Inc., Brillion, Wis. Mr. Schwenn has been with the Caterpillar Tractor Co., Peoria, Ill., for the last fourteen years in a similar capacity.

\* \* \*

### A Novel Award Solves Absentee Problem

The daily press reports that a method adopted by the New Britain Machine Co., New Britain, Conn., of awarding a Swastika Hitler plaque to the department having the worst absentee record each week has produced excellent results. It is understood that it soon became unnecessary to make the award, because the records of the various departments in regard to absences from work immediately improved.

## OBITUARIES

### James G. Blunt

James Griswold Blunt, assistant to James E. Davenport, vice-president in charge of engineering of the American Locomotive Co., died in Schenectady, N. Y., on February 15 at the age of seventy-four. Many devices for meeting the high-speed requirements of railroads in recent years were designed by Mr. Blunt.

He was born on April 7, 1868 at Cincinnati, Cortland County, N. Y. After graduating with the degree of mechanical engineer from the University of Michigan in 1894, he worked for three years as a machinist and draftsman for several concerns, and for a brief period was instructor in manual training in the Pueblo, Colo., high school.

In 1897, he accepted a position as draftsman with the Brooks Locomotive Works at Dunkirk, N. Y., and from 1899 to 1906 was chief draftsman of the company. When the Brooks Locomotive Works was merged with other companies into the American Locomotive Co., Mr. Blunt became engineer for the drafting department of the company at Schenectady. In 1936 he was appointed chief mechanical engineer, and in 1941 assistant to the vice-president in charge of engineering.

Mr. Blunt was a member of the Association of American Railroads and of the American Society of Mechanical Engineers. He served as honorary vice-chairman of the Schenectady Division of the latter society in 1923. He was also a past-president of the Society of Engineers of Eastern New York.

### John G. Barry

John G. Barry, honorary vice-president of the General Electric Co., Schenectady, N. Y., died at his home in Schenectady on March 4, following a long illness, at the age of seventy-five years. Mr. Barry had retired as senior vice-president of the company in 1935 after more than forty-five years of service. He was born in Boston in 1868, and educated in the public schools of that city. In 1885, upon graduating from high school, he entered the electrical industry as an apprentice and test man with the Thomson-Houston Co., a predecessor of the General Electric Co., at Lynn, Mass. When he completed his apprentice training in 1890, he was assigned to the construction department, and later was sent to the company's Boston office.

In 1892, when the General Electric Co. was formed, Mr. Barry became a

member of the railway department, which at that time was one of the company's two main divisions. Sales work held a particular appeal for him, and existing opportunities in the electric railway field enabled him to do pioneer work. In 1897, he was made assistant manager of the railway department, and in 1907, became manager. Ten years later he took over the duties of general sales manager, while still retaining the managership of the railway department. Mr. Barry was a member of the American Institute of Electrical Engineers, and of the Engineers, Railroad, and Bankers Clubs in New York.

### Stanton Hertz

Stanton Hertz, vice-president and assistant to the president of the Copperweld Steel Co., Glassport, Pa., lost his life in a fire in his home in Pittsburgh, Pa., on February 27. His thirteen-year-old daughter, Alice, also perished, and his wife and another daughter, Lois, were critically injured.

Mr. Hertz was born in Montgomery, Ala., in 1894, and was a graduate of the Alabama Polytechnic Institute, Auburn, Ala. In the first World War, he








**Stanton Hertz**

served as a lieutenant in the Engineers Corps, and in 1921 he became connected with the Copperweld organization, holding the positions, successively, of chief engineer at the New York office, general manager of sales, and vice-president.







### Martin Schiff

Martin Schiff, chief engineer of the Century Electric Co., St. Louis, Mo., died suddenly on February 15 at the age of fifty-two years. He remained

# WHEN IT COMES TO FINISHING...

THERE ARE SEVERAL GOOD REASONS WHY  AND  MANUFACTURERS ARE USING "MICHIGAN" GEAR FINISHING MACHINES SO EXTENSIVELY. THEY CAN TELL YOU A LOT ABOUT THE VASTLY INCREASED  OUTPUT AND THE GREATER ACCURACY  OBTAINED WITH THESE MACHINES, EMBODYING THE  PRINCIPLE.

IMPORTANT HOWEVER, ALSO, IS THE FACT THAT THERE IS A "MICHIGAN" TO SUIT EVERY PURPOSE. THERE IS A LIGHT DUTY 861-48  WHICH WILL HANDLE GEARS FROM  DOWN TO . THERE ARE 12 TYPES OF 860'S  FOR 'S FROM  INCH TO 18 INCHES INCLUDING  GEARS.

FOR MAXIMUM PRODUCTION AND LOWEST TOOL  , THERE IS THE 900 SERIES  RACK TYPE MACHINE. THEN YOU HAVE THE 862'S  WHICH WILL FINISH GEARS UP TO TWO FEET  AND THE VARIOUS MODEL 865'S  WHICH RANGE IN CAPACITY AS HIGH AS 16 FT. 

THERE IS A BULLETIN  ON EVERY STANDARD MACHINE TYPE. WRITE TODAY ON YOUR COMPANY LETTERHEAD.

**MICHIGAN TOOL COMPANY**  
7171 E. McNICHOLS ROAD • DETROIT, U. S. A.

MACHINERY, April, 1943—249

at the Century plant until after the usual quitting time on the evening of February 15, and although not feeling well, he drove to his home, where he passed away at 8:30 P.M.

Mr. Schiff was born in New York City, and was a graduate of Cornell University, class of 1912. He was employed as test engineer by the Diehl Mfg. Co., Elizabeth, N. J.; as assistant engineer by the Ideal Electric & Mfg. Co., Mansfield, Ohio; as designing engineer by the Electro Dynamic Co., Bayonne, N. J.; as chief engineer by Roth Bros. & Co., St. Louis, Mo.; and as assistant chief engineer and assistant to the president of the Imperial Electric Co., Akron, Ohio. He joined the Century organization in 1933.

From 1916 to 1919, Mr. Schiff served in the U. S. Navy as a lieutenant. He was a fellow member of the American Institute of Electrical Engineers. Mr. Schiff is survived by his wife, a son, and a daughter.

### Homer C. Bayliss

Homer Calvin Bayliss, a director of the Motch & Merryweather Machinery Co., Cleveland, Ohio, and co-manager of the Detroit office of that company, died on Sunday, March 14, after a brief illness. He was born in 1885 in Denison, Tex., and was a graduate of Marietta College and Ohio Wesleyan University. Mr. Bayliss held an outstanding position in the machine tool field. He also had many other interests, particularly relating to education and civic affairs. He served in the armed forces in the first World War from 1917 to 1919.

Mr. Bayliss was a member of the American Society of Tool Engineers, the Detroit Engineering Society, the Detroit Board of Commerce, and many other organizations. He is survived by his wife, formerly Edwina Kiefer; a daughter, Mrs. Richard Simon, of Denver, Colo.; and a brother, Wallace M. Bayliss, of Bridgeport, Conn.

JACOB ANDREW MENGES, employed by the Motch & Merryweather Machinery Co. as a sales engineer for twenty-two years, died in Pittsburgh, Pa., on February 22. Mr. Menges was born in Brownsville, Pa., in 1898. He attended the University of Pittsburgh, and was a member of the American Society of Tool Engineers. He is survived by his widow, a daughter, and one sister.

C. G. GILBERT, manager of the Detroit office of the Federal Products Corporation, died on January 28 in Detroit, following a heart attack and brief illness, at the age of sixty years. Mr. Gilbert had been connected with the Federal Products Corporation for twenty-two years. He had held the position of manager of the Detroit office since 1926.

## COMING EVENTS

APRIL 6-7—WESTINGHOUSE MACHINE TOOL FORUM to be held at the plant of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

APRIL 8-9—Aeronautic meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at the Hotel New Yorker, New York City. John A. C. Warner, secretary and general manager, 29 W. 39th St., New York City.

APRIL 26-28—Spring meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS in Davenport, Iowa. C. E. Davies, secretary, 29 W. 39th St., New York City.

APRIL 28-30—WAR PRODUCTION CONGRESS and annual meeting of the AMERICAN FOUNDRYMEN'S ASSOCIATION in St. Louis, Mo.; headquarters, Hotels Jefferson and Statler. C. E. Hoyt, executive vice-president, 222 W. Adams St., Chicago, Ill.

MAY 26-27—PRODUCTION CONFERENCE of the NATIONAL METAL TRADES ASSOCIATION at the Palmer House, Chicago, Ill. Homer D. Sayre, commissioner, 122 S. Michigan Ave., Chicago, Ill.

JUNE 2-3—Diesel Engine and Fuels and Lubricants Meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at the Hotel Carter, Cleveland, Ohio. John A. C. Warner, secretary and general manager, 29 W. 39th St., New York City.

JUNE 9-10—War Materiel Meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at the Book-Cadillac Hotel, Detroit, Mich. John A. C. Warner, secretary and general manager, 29 W. 39th St., New York City.

JUNE 14-16—Semi-annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS in Los Angeles, Calif. C. E. Davies, secretary, 29 W. 39th St., New York City.

SEPTEMBER 30-OCTOBER 2—Aircraft Engineering and Production Meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at the Biltmore Hotel, Los Angeles, Calif. John A. C. Warner, secretary and general manager, 29 W. 39th St., New York City.

### Record Performance by War Worker

Honors as the nation's steadiest war plant worker could probably be awarded to Lloyd Van Ness, head of the disposal system of the Propeller Division of Curtiss-Wright Corporation, who, late in January, had a record of having worked 758 consecutive days without a single absence—Saturdays, Sundays, and all holidays included. To stay continuously on the job seems to be a quality of the Van Ness family. Mr. Van Ness's son, John Stiles Van Ness, as a marine raider at Guadalcanal battled Japanese forces for 118 continuous days and nights, the longest sustained combat in American history.

\* \* \*

### Aluminum Prices Again Reduced

Announcement has been made by the Aluminum Co. of America, Pittsburgh, Pa., of a new and lower schedule of prices for semi-fabricated and fabricated aluminum, effective March 1. The company states that increased volume of production, together with new and improved methods and equipment, has greatly reduced many costs connected with the fabrication of aluminum, and thereby has made this price reduction possible. The recent reduction added to previous price reductions has lowered the price from 20 cents in 1939 to the present level of 15 cents a pound.

\* \* \*

### New Chapters of Tool Engineers' Society

The American Society of Tool Engineers has chartered two more chapters—the fifty-sixth and the fifty-seventh—one at Fort Wayne, Ind., and one at Kansas City, Mo. Cyril Grindrod, assistant to the vice-president in charge of production of the S. F. Bowser Co., Inc., is chairman of the Fort Wayne chapter, and W. W. Mason, of the engineering department of Black, Sivalls & Bryson, Inc., is chairman of the Kansas City chapter.

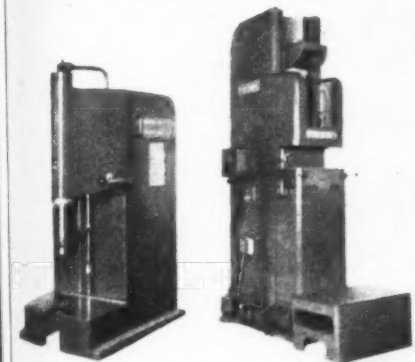
### Women Qualify as Arc Welders

The first class of women welders graduated from the twenty-five year old Lincoln School of Arc Welding, maintained by the Lincoln Electric Co., Cleveland, Ohio, recently received their diplomas as arc welders. The school opened its first course to women early in January. Thirteen women completed the four-week course. These women are now engaged in arc-welding work in various war plants. Formerly, they were housewives, waitresses, and office workers.

**You CAN pick the  
wrong Machine**

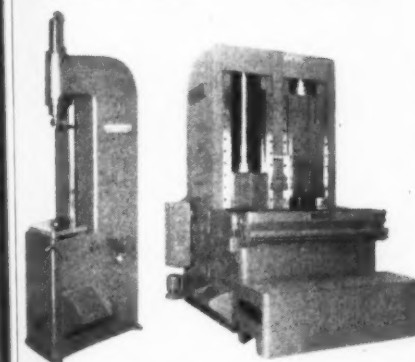


**UNIVERSAL HORIZONTAL**



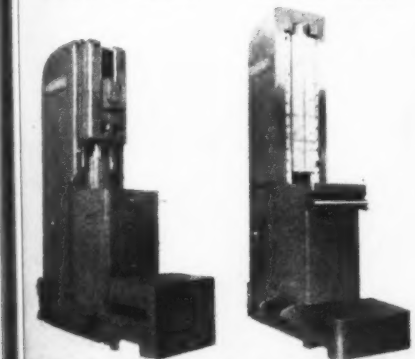
**"JUNIOR" PRESS**

**PULL-UP**



**"SENIOR" PRESS**

**DUAL RAM**



**PULL-DOWN**

**SINGLE RAM**

**These standard Colonials  
come in scores of models**

*How to get more production  
with your Broaches-----*

### **3. BY PICKING THE RIGHT MACHINE FOR THE JOB**

**T**HE very flexibility of broaching machines—the variety of jobs to which each standard "Colonial" can be applied — frequently makes it difficult for the user to select the proper type of broaching machine for a specific operation or group of operations. Proper machine selection depends primarily on three factors:

1. The nature of the job.
2. The capacity required.
3. The length of stroke needed.

Following are some hints as to selection of the best machine type for different kinds of jobs:

**ROUND HOLE BROACHING:** Can be handled on practically every type of standard broaching machine except those specifically designed for surface broaching. If parts are extremely large, or floor space is at a premium, a vertical machine is preferable to a horizontal type. If the operation is mainly a "sizing" job, or if the broach is not too large, a "Senior Press" may be used.

If permissible for parts to drop off the broach at the end of the stroke, and not too large to handle properly, a "Pull-up" may be used.

If the parts are too large, or if the part requires accurate locating in a fixture, a "pull-down" may be preferable.

**SURFACE BROACHING:** In high production, the most suitable machines are Colonial Single and Dual Ram vertical machines. If maximum production capacity is not required, a "Senior Press" may be used on light jobs. Lower production surface broaching operations may also be performed on a "Universal Horizontal" if already available. If automatic indexing is desired, a "Senior Press" or a ram type of machine should be used.

**KEYWAYS:** While keyways may be broached on vertical machines, it is usually best to use a "Universal Horizontal" for this work in combination with a key-way horn. This type of machine provides greater ease of loading for such work.

**HELICAL SPLINES:** Best performed on a "Universal Horizontal" in combination with a helical lead bar, providing maximum accuracy and ease of handling. Can also be performed on vertical machines, of course.

The above, of course, is not a complete summary and individual recommendations may differ depending on the nature of the job. As to machine capacity and length of stroke, it is always advisable to obtain the recommendation of your broaching machine and broach producer. Here the best guide is still "experience"—the knowledge acquired from tooling and studying thousands of broaching operations.

# **colonial** **BROACH COMPANY**

*Broaching Machines*



*Broaches-Broaching Equipment*

**DETROIT . . . . U. S. A.**

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Your Progress Depends Upon Your Knowledge of Your Industry